Daily Bread

Are tortillas and breads in Mexico adequately fortified?



Proyecto Alimente

Changing Markets FOUNDATION

This report has been written and researched by the Changing Markets Foundation in collaboration with independent researchers.

The purpose of the report is to shed light on industry-specific issues related to fortification of flour products in Mexico. The information in this document has been obtained from sources believed reliable and in good faith. The authors accept no liability whatsoever for any direct or consequential loss arising from the use of this document or its contents.

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Executive summary

Poor-quality diets not only contribute to the rise of obesity and non-communicable diseases but also lead to micronutrient deficiencies – a lack of vitamins and minerals that are essential for health. Micronutrient deficiencies remain a significant problem in Mexico, where, in recent years, nine out of ten women do not get enough iron in their diet, a quarter of adult men do not get enough zinc and anaemia rates appear to have increased among all age groups. This can have serious consequences: If nutritional anaemia is not identified and resolved before a child reaches two years old, the damage to health becomes irreversible.

Food fortification is an important and effective tool in the fight against micronutrient deficiencies. For this reason, Mexican law already requires wheat and nixtamalized maize flour to be fortified with iron, zinc, folic acid and other B vitamins. The current standards have been in place for a decade. Building on our previous investigation, which showed that only 7% of packaged flours available at retail level in Mexico are adequately fortified, this report goes further to look at whether food processors are buying and using wholesale flour fortified according to the Mexican standard. It represents the first independent testing, and comparison with the flour-fortification standards, of the nutritional content of industrially produced tortillas and breads in Mexico.

Our findings reveal that the legal requirements for fortification of flours are not translating into adequate fortification of breads and tortillas. Only 14% of bread products (6 out of 43) and 1.5% of tortilla products (1 out of 69) clearly met the minimum iron and zinc levels mandated in the flour-fortification regulation. It also appears that barely any of these products contain the recommended type of iron. This is concerning, given that tortillas and bread are both staple foods in Mexico, with per-capita consumption at 57kg and 34kg per year respectively.[1] These results show that companies cannot be trusted by themselves to procure adequately fortified flour for use in making flour-rich products, nor to guarantee nutritious foods for the population.

This report shines a spotlight on multi-billion-dollar companies with significant experience in food processing, such as Grupo Bimbo, the bakery giant, and Gruma, a world leader in tortilla manufacturing. We tested 11 bread products (86 samples) and 12 tortilla products (89 samples) from Grupo Bimbo, covering the brands Bimbo, Oroweat, Wonder, Sanissimo, Tia Rosa, Del Hogar and Milpa Real. Only one bread and one tortilla product from Grupo Bimbo contained quantities of both iron and zinc that clearly met the flour-fortification standard. We tested seven products (45 samples) made by Gruma (which produces the Mission brand of tortillas), none of which contained levels of iron or zinc that clearly met the flour-fortification standard. The quantities of iron and zinc in Gruma tortillas were also notably lower than in products from most other companies; indeed, several products had such low levels that it raises the question whether the flour used was fortified at all.

It is not only flour millers that have a moral responsibility for tackling micronutrient deficiencies; food manufacturers also play a critical role in delivering micronutrients through adequately fortified products. As such, these companies should have robust systems in place to procure and use adequately fortified flour. There is no good reason for corporate giants to sidestep their responsibility, and no excuse for their failure to procure flours fortified to the legal standards.

This report presents a further opportunity for the new government in Mexico to update the fortification regulations to cover breads and tortillas, thus closing the regulatory loophole. The new administration should take corrective measure to address the failings of the food industry and uphold the law, which was established to guarantee that people in Mexico get essential nutrients through staple foods.



1. Introduction

The recent EAT-Lancet Commission report outlined how unhealthy diets now pose a greater risk to people than unsafe sex and alcohol, drug and tobacco use combined.[2] Poor-quality diets not only contribute to the rise of obesity and non-communicable diseases but also cause micronutrient deficiencies – a lack of vitamins and minerals that are essential for health. Often called 'hidden hunger', deficiencies in micronutrients have a serious impact on people's health, growth, learning and productivity.

Micronutrient deficiencies remain a significant problem in Mexico. The 2012 national health survey highlighted that nine out of ten women do not get enough iron in their diet.[3] Preliminary results from the 2018 National Health and Nutrition Survey (ENSANUT) indicate that anaemia rates have increased among all age groups in Mexico in recent years, but especially among women of reproductive age, among whom the rate nearly reached 30%.[4] Iron deficiency is thought to be the most common cause of anaemia globally.

One in four children in Mexico suffers from anaemia, with at least half of these cases attributable to iron deficiency.[5,6] Anaemia has consequences for all stages of life: In children it can cause delayed physical and mental growth, and in adults it can lead to depression, fatigue, loss of productivity and disability.[7] If nutritional anaemia is not identified and resolved before a child reaches two years old, the damage to healthy physical and mental development becomes irreversible.[8]

Zinc is also a substantial deficiency among children and adult men in Mexico, with around a quarter not getting adequate intakes through diet.[9] Zinc deficiency weakens the immune system and increases the risk of dying from infections.[10]

The best way to prevent and overcome the problem of micronutrient deficiencies is to ensure access to a diverse range of high-quality, traditional and nutritious foods, and limit the consumption of ultra-processed foods. However, complementary measures are often necessary as many people do not have access to, or cannot afford, a diverse range of nutrient-rich foods. Furthermore, it is often difficult for pregnant women to get the recommended daily amount of folic acid through diet alone.[11]

Food fortification is one effective, complementary tool that can be used to address micronutrient deficiencies if it is implemented properly. Mexico already has a law in place (NOM-247-SSA1-2008) that requires maize and wheat flour to be fortified with iron, zinc, folic acid, niacin, thiamine and riboflavin.[12] The measure is

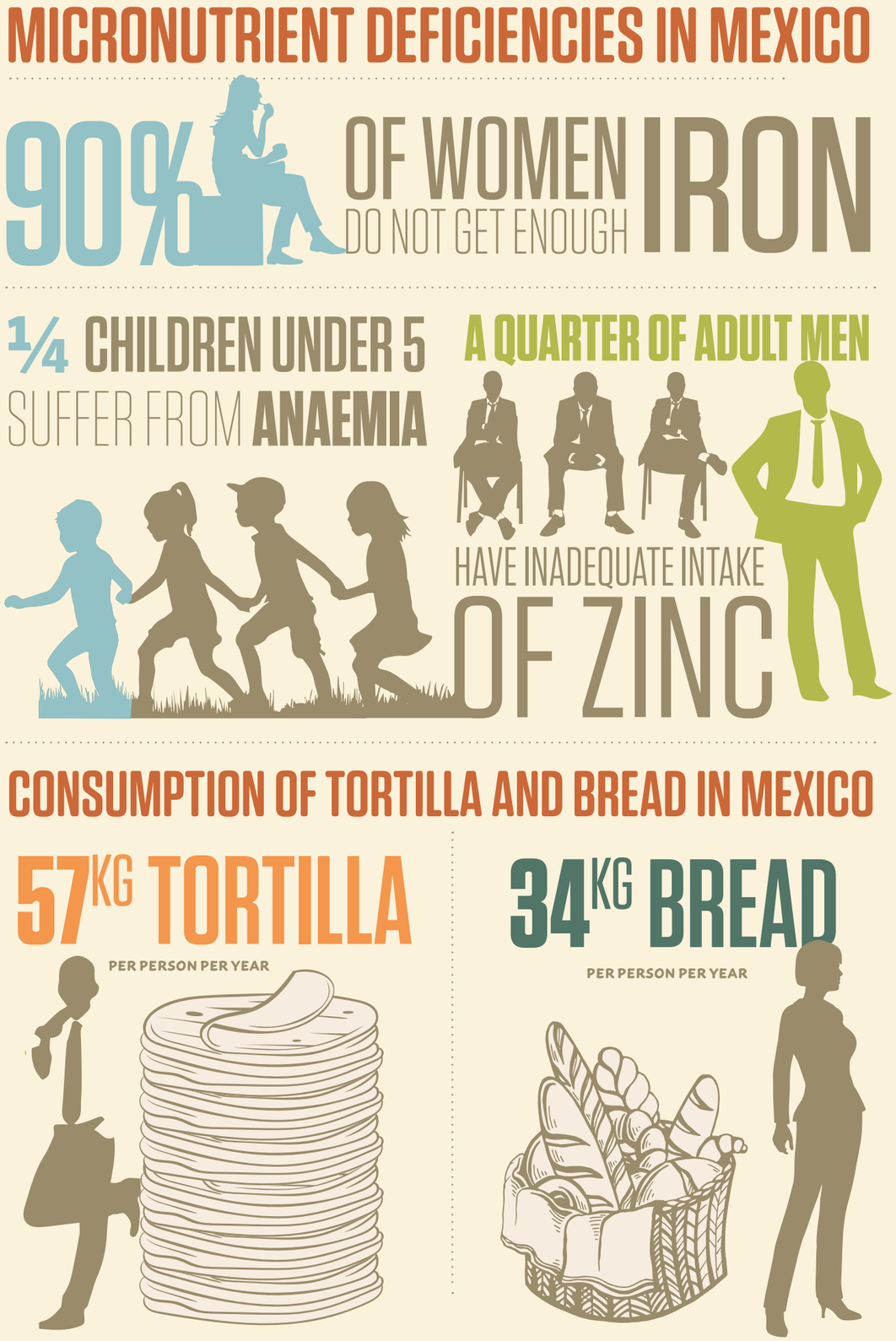
intended to restore up to 60% of the micronutrients lost in the industrial processing of refined flour, in addition to supplementing the micronutrients most lacking in the Mexican diet.[13] However, for people in Mexico to get the full benefit, it is crucial that flour-milling companies are compliant with the law and that adequately fortified flour is used by industrial food manufacturers, which make flour-rich products like tortillas and breads.

In Mexico, tortillas are a staple food, and the majority are produced using maize. In 2017, more than 80% of households spent at least 6.5% of their income on maize tortillas alone.[14] At the same time, consumption of wheat products has risen to a record 116 million tons, according to the industry group Canainpa.[15] Bread has become a staple in the Mexican diet, with per-capita consumption at 34kg per year, of which approximately 70-75% is white bread.[16] According to a recent article in the *New York Times*, the consumption of tortillas in Mexico has dropped nearly 45% during the last three decades as Mexicans consume increasingly more bread and fast food.[17] Quality tortillas made through the traditional process of nixtamalization are being abandoned in favour of white bread and homogenised industrial tortillas made with processed and rehydrated maize flour.[18]

1.1 Why this study?

Although Mexico has legislation mandating fortification of flours, our previous research revealed that only 7% of packaged maize and wheat flours available to consumers at retail level were fortified adequately, which signals a huge failure on the part of flour-milling companies.[19] Following these results, we decided to investigate further whether the flour consumed in the form of breads and industrially produced tortillas is correctly fortified. We therefore conducted the first independent testing of brand performance on the nutritional content of industrially produced breads and tortillas on sale in Mexico to see if companies making these products are procuring and using fortified flour according to the Mexican standard. We focused only on industrially produced tortillas made with nixtamalized flour, and not on traditionally made tortillas made using *masa* (freshly nixtamalized maize), as these are not covered by the flour-fortification law.

Both the flour-milling companies and bread and tortilla manufacturers have a crucial role to play in the optimal delivery of fortified products. The food processors using wheat and maize flours as ingredients in breads and tortillas have a moral responsibility to tackle nutritional challenges, such as anaemia and micronutrient deficiencies.



Industrial vs traditional tortillas

There are two different ways of making tortillas: the traditional method and the industrial method. The traditional method is where maize kernels are cooked with quicklime, steeped in the cooking water overnight and then rinsed. This process is known as *nixtamalization*, and it produces fresh dough, called *masa*. Industrially produced maize flour is often called *nixtamalized*, but the production process is not the same as the traditional process. The industrial method, known as *enzymatic nixtamalization*, produces an instant dried flour that is cheaper to make due to the quicker production time and use of less water and lime. This dried flour can then be reconstituted to make a dough.[20] Almost all commercially available maize flour is now prepared using this industrial process.

Approximately half of *tortillerías* use the traditional nixtamalization process and half use industrially processed maize flour for making their tortillas.[21] However, in cities, approximately 80% of *tortillerías* use the industrially processed maize flour rather than the traditional process, because it is less time-consuming.[22] Besides *tortillerías*, there is a growing trend of supermarkets making their own fresh tortillas on the premises and selling them more cheaply than the smaller operators in order to attract customers. Industrially produced packaged tortillas are also increasingly sold throughout Mexico in markets, supermarkets and smaller convenience stores.

Research and testing undertaken in Mexico City show that tortillas made from fresh *masa* dough using the traditional process are higher in dietary fibre, calcium and iron than industrially processed maize tortillas. This is partly due to the processing techniques, but also because of the different types of maize used.[23] Since there are different variations of traditional nixtamalization, in line with the type of maize, the variety of quicklime and the environmental conditions, it is not possible to talk about a single type of traditional nixtamalized tortilla, making comparisons cumbersome.[24]

Artisanal or traditional tortillas are crucial for not only safeguarding the diverse landscape of traditional maize varieties (65 native maize landraces and thousands of varieties exist in Mexico) but also supporting small-scale producers. Traditional tortillas are often made locally by family businesses, and are therefore not subject to the same supply chain as industrially produced flour and large-scale manufacture of industrially produced tortillas. Traditional tortillas are not covered by the flour-fortification law and do not fall within the scope of this report.

2. Loophole in the law

The current Mexican standard on flour fortification has been in place for nearly a decade. It requires flour companies to fortify nixtamalized maize and wheat flours with iron, zinc, folic acid and other B vitamins.[25] The law is clear: The obligation to fortify wheat and maize flours lies with the industrialised flour producers. However, our investigation and test results show this piece of legislation has been badly implemented by most of the companies, whose flour we tested in late 2018. The results showed that many wheat and maize flours were fortified to some extent but either did not meet the required minimum level for iron and zinc or did not use the recommended iron sources. Our investigation concluded that only 7% of all products were adequately fortified, meaning they met minimum requirements for both iron and zinc, *and* used one of the recommended iron compounds.

We identified the following legal loopholes in the regulation, which have created an environment in which companies neglect their responsibility to help tackle micronutrient deficiencies in the Mexican population.

- The regulation does not obligate but only makes recommendations with regards to the use of specific iron compounds in the fortification process, leaving the possibility for companies to use the much cheaper, but less bioavailable, electrolytic iron.

TABLE 1 - MINIMUM AMOUNTS OF NUTRIENTS TO BE ADDED TO FLOUR (MG / KG OF FLOUR)

	MINERALS		B VITAMINS			
	Iron	**Zinc**	**Folic Acid**	**Niacin**	**Riboflavin**	**Thiamine**
RECOMMENDED SOURCES	Ferrous sulphate Ferrous fumarate	Zinc oxide	Folic acid	Nicotinamide	Riboflavin	Thiamine mononitrate
WHEAT	40	40	2	35	3	5
MAIZE	40	40	2	35	3	5

Secretaria de Salud (2009) Norma Oficial Mexicana NOM-247-SSA1-2008

- It does not state clearly that electrolytic iron should not be used to fortify nixtamalized maize flour, in accordance with recent World Health Organization (WHO) guidelines, which highlight that electrolytic iron is not effective when used with nixtamalized maize flour.

- It does not specify which government agency is responsible for overseeing external compliance and enforcement – at the mills, at the retail level or at points of import.

- It does not specify how frequently external monitoring should be carried out and with which methods, or provide details about the measures of success or penalties that can be imposed when companies are not compliant.

- It does not specify where the external monitoring results are published and how the findings can be accessed by consumers, civil society and industry.

- It does not state that adequately fortified flour must be used in the production of industrially produced tortillas, breads and other flour-rich products.

Since, under the previous government administration, the legislation was not properly enforced and external monitoring was incomplete, it has remained the responsibility of the flour-milling industry to regulate itself. However, our previous testing results highlighted that flour companies have been lax in correctly adding the micronutrients required by law, and have operated with relative impunity.

As maize and wheat flour in Mexico should be fortified according to the law, it could be that legislators have presumed the bakery sector will procure and use fortified flours for making flour-rich products. This has shifted the sole responsibility for adequate fortification of tortillas, breads and other flour-based products onto the flour-milling companies. There is no legal obligation for food processors to have good systems in place to buy flour that has been fortified according to the Mexican standard. Manufacturers of breads and tortillas seem to have all the discretion to decide whether to procure flour fortified to the Mexican standard or not. Given our previous research, which shows that most flour companies do not comply with the law, this means food processors are doubly let off the hook from their responsibility to provide fortified products and contribute to addressing micronutrient deficiencies in Mexico. Furthermore, the lack of comprehensive monitoring of the nutritional qualities of industrially produced bread and tortillas suggest that no government agency has so far been sufficiently vigilant to this loophole in the fortification supply chain

3. Testing breads and tortillas for levels of micronutrients

3.1 Methodology

The research undertaken for this report aimed to assess the effectiveness of Mexico's current flour-fortification programme regarding the extent to which it reaches industrially produced tortillas and breads. This represents the first independent investigation and testing of brand performance on the nutritional content of industrially produced breads and tortillas available at retail level in Mexico since current flour-fortification standards were introduced.[26]

We collected 220 bread samples from 43 different products, covering popular brands produced by 15 different companies. This included a variety of different bread products, such as *pan de caja*, *bolillo*, baguettes, bagels and *telera*. We collected 326 tortilla samples from 69 different products, covering popular brands made by 20 different companies. This included tortillas made from both maize and wheat flour, and *sopes* (similar to a fried, thick tortilla with charactristic pinched sides). For both bread and tortilla products we collected a mixture of packaged and over-the-counter fresh produce. For tortillas, we only focused on collecting samples from products made using industrially produced flour.

The majority of samples were collected from different locations in Mexico City and Puebla, with an emphasis on obtaining a wide coverage of brands. Since tortillas made from wheat flour are a staple food found in the northern states of Mexico, many of these samples were collected in the state of Sonora. Samples were predominantly taken between October and December 2018 by project partner Proyecto AliMente. Products were then sent to the laboratory for testing of their nutritional levels, as described below.

3.2 Testing procedure

A total of 220 bread and 326 tortilla samples were submitted for analytical testing, which Laboratorios Fermi carried out in accredited facilities in Mexico City.[27] The laboratory tested products in two stages: to analyse nutritional content, and to assess whether they were adequtely fortified.

KEY SAMPLING STATISTICS

Breads

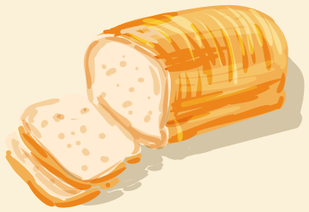
Samples:

220

Different products:

43

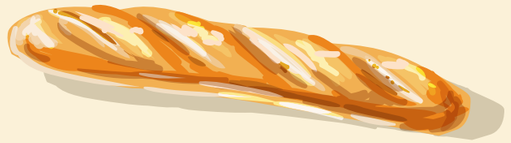
Pan de caja 16



Bolillo 12



Baguette 7



Telera 2



Bagel 2



Other 4



Companies

GRUPO BIMBO · CHEDRAUI cuesta menos · COSTCO WHOLESALE · Elizondo DESDE 1943 · Miller · FlowersFoods · laComer · Esperanza · Espiga HARINA DE TRIGO · LECAROZ · Mr. Dely · NEW YORK DELI & BAGEL · Soriana · Walmart · EUROBAGEL

Tortillas

Samples:

326

Different products:

69

Wheat tortilla 37



Maize tortilla 29



Sopes 3



Abarrey · GRUPO BIMBO · CHEDRAUI cuesta menos · gruma · laComer · OvarB · KUA · Soriana · Deli DIPS & SNACKS · OCHOA · Becarel · Walmart · SUSALIA Horneadas · TIRIXCOM · Juan Carlos Paredes Soto · Productos Alimenticios Janette · Grupo San Tito · PROVEEDORA DE TORTILLAS DE MAÍZ

First, individual samples underwent an 'iron spot test'.[28] In flours, this test turns any added iron compounds into visible red spots when treated with a chemical solution, therefore showing a clear distinction between products that are fortified and those that are not.[29] However, for breads and tortillas, the spot test does not clearly distinguish between fortified and unfortified products; instead, it indicates whether the batches of flour used to make the product have been fortified with a soluble or non-soluble form of iron.

When treated with a chemical solution, any breads and tortillas that have been fortified with elemental iron powders (e.g. electrolytic iron or reduced iron) will show up as visible red spots on the product, because these forms of iron do not dissolve when mixed with water to make the product. However, products fortified with any soluble forms of iron (e.g. ferrous fumarate or ferrous sulphate), when treated with a chemical solution, are unlikely to show visible red spots but instead give a red tinge. This is because these types of iron are expected to dissolve as water is added to flour to make the bread or tortilla. However, this test also shows a red tinge in products that are not fortified at all, where iron occurs naturally as part of the product.

Second, samples of the same product were homogenised and tested to determine the levels of iron and zinc. This test was carried out in line with analytical methods referred to in the regulation,[30] and the results were then compared with the minimum levels mandated for flours. If this quantitative test showed very low levels of iron and zinc, this further indicates that a product is unlikely to be made with adequately fortified flour.

3.3 Product ranking

The results are presented separately for breads and tortillas. To provide a clear picture of how each product performed in our test for levels of iron and zinc, we have used a traffic-light rating system. Green indicates the levels are above 40mg per kg; amber shows the levels are 30–40mg per kg; and red shows levels are below 30mg per kg.

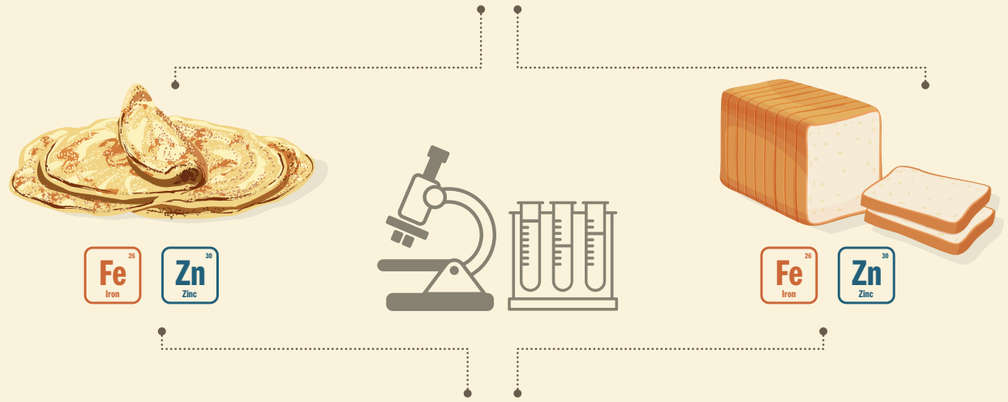
Therefore, if a product is categorised as green for both iron and zinc levels, it is considered to be made using adequately fortified flour with quantities clearly meeting the minimum requirements. Given the normal range of uncertainty associated with the analytical test, we have presented the average content of iron and zinc found (mg per kg) in the product, as well as giving the upper and lower levels of the range. We consider a product to be made using adequately fortified flour if the levels score green across the range.

The rationale for this traffic-light rating is because breads and tortillas are not 100% flour, and each product will have a slightly different percentage of moisture content. We have assumed that up to a quarter of a product's mass could be moisture, but the exact percentage depends on a range of factors.[31] For this reason, and given that the regulations for flour fortification set the levels of iron and zinc at 40mg per kg as a *minimum*, we have chosen to assume that concentrations of iron or zinc ranging between 30–40mg per kg of a ready-to-eat bread or tortilla product could potentially, but not certainly, be made using flour fortified above required levels. However, any iron or zinc levels under 30mg per kg of a ready-to-eat bread and tortilla product raise serious questions about whether the product is made using flour that is adequately fortified.

The iron spot test is less conclusive for determining whether iron is present in breads and tortillas naturally or through the fortification process. We have therefore not included a rating for each product based on the type of iron present; however, the product results tables include details about whether elemental iron was suspected to be present as per the iron spot test. In the overall results table for each company, we have also highlighted and commented on the proportion of the company's products that are suspected to be using elemental iron. This is because elemental iron, such as electrolytic or reduced iron, is less well absorbed by the human body than ferrous fumarate or ferrous sulphate.

The Mexican legislation does not obligate the use of specific iron compounds in flour fortification, but it does make recommendations, based on scientific evidence, of the best iron sources to use. The law recommends ferrous sulphate or ferrous fumarate for the fortification of wheat and maize flours.[32] Additionally, recent WHO guidelines clearly state that electrolytic iron is not effective in the fortification of nixtamalized maize flours, and lists NaFeEDTA as the recommended iron compound for the fortification of wholegrain wheat flour.[33,34] Companies that use less-bioavailable iron compounds (those that are less well absorbed by the human body) to fortify their products reduce the potential impact of the national fortification programme and miss the opportunity to improve people's health.[35]

IS MEXICO'S FLOUR FORTIFICATION PROGRAMME REACHING INDUSTRIALLY PRODUCED BREADS AND TORTILLAS?



How do levels of iron + zinc compare with the minimum levels given in the flour fortification regulation?

Clearly **meets minimum requirements** in flour fortification regulation

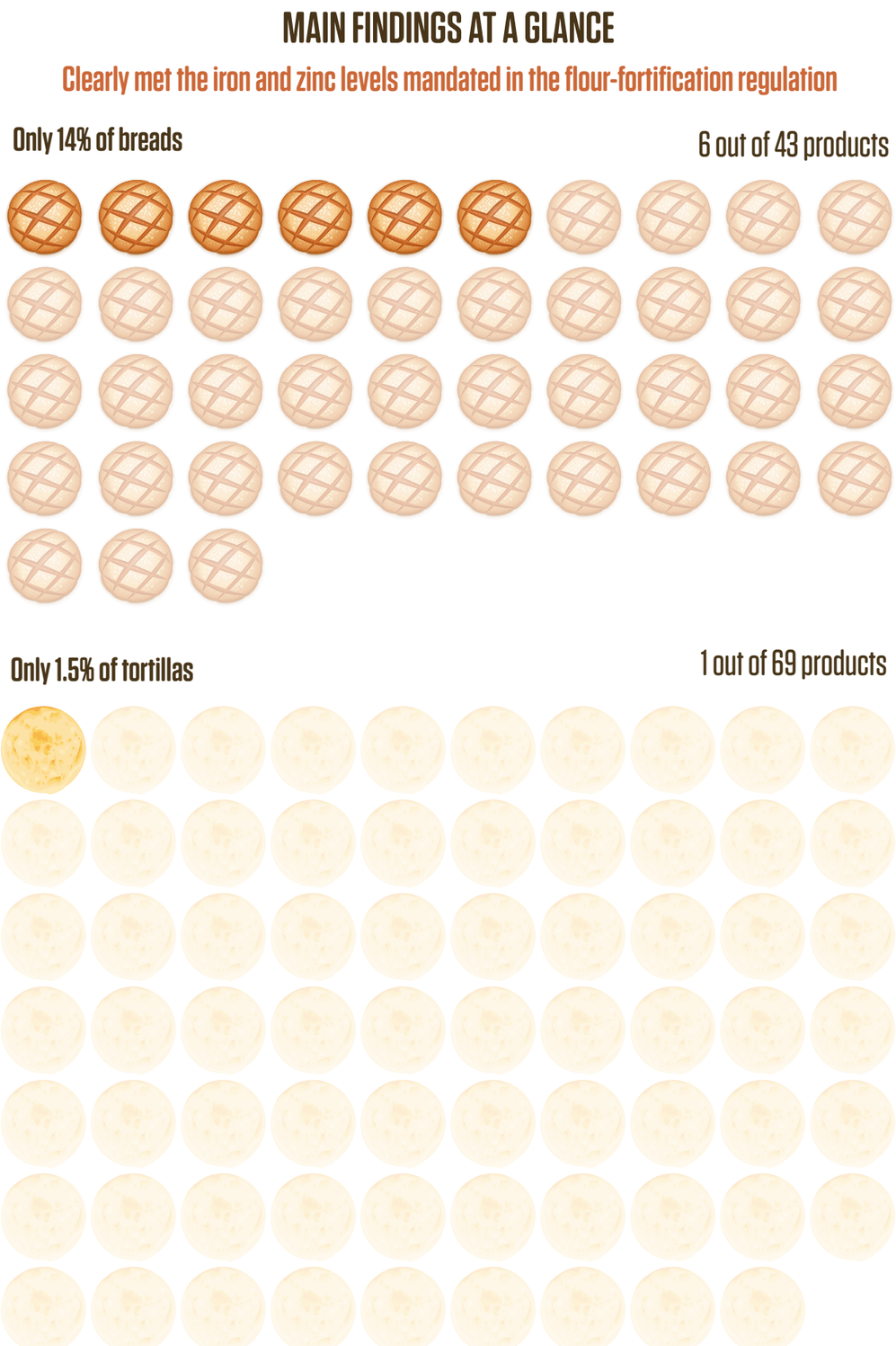
Product **likely** to be made with adequately fortified flour

Could not be confidently said to meet minimum requirements in flour fortification regulation

Uncertain whether product is made with adequately fortified flour

Clearly **below minimum requirements** in flour fortification regulation

Product **unlikely** to be made with adequately fortified flour



4. Results

4.1 Main findings

Overall, results reveal a failure of food processors and supermarkets to use adequately fortified flour in the production of their breads and tortillas on sale in Mexico. Although the majority of breads and tortillas we tested were fortified to some extent, our results show only 14% of breads (6 out of 43 products) and 1.5% of tortillas (1 out of 69 products) clearly met the iron and zinc levels mandated in the flour-fortification regulation.

The six bread products we considered adequately fortified (Bimbo's Pan Blanco Sin Orillas, Chedraui's white baguette, Costco's Kirkland Signature white *bolillo* and three bread products from Soriana) all clearly reached the necessary iron and zinc levels. However, it should be noted that all samples from these products are suspected to contain elemental iron, a less-bioavailable source of iron that is not recommended in the fortification regulation. In the one tortilla product (Bimbo's Milpa Real tortilla *con nopal y linaza*) that contained the necessary levels of both iron and zinc, elemental iron was not detected. It is not clear whether the product is made using flour fortified with a recommended soluble type of iron or whether the product has high levels of iron present from other added ingredients.

The majority of breads and tortillas we tested were fortified, to some extent, but insufficiently. For example, 19% of breads and 17% of tortilla products contained levels of iron above the minimum requirements outlined in the flour-fortification regulation but did not meet the levels on zinc. And, vice versa, 37% of breads contained levels of zinc compliant with the standard, but not all of these products clearly met the levels on iron. All tortilla products, apart from one, failed to show quantities of zinc clearly above the minimum requirements.

Furthermore, our results also suggest that the less-bioavailable elemental iron is used in the fortification of the large majority – 84% – of both bread and tortilla products. For breads and wheat flour-based tortillas this is a very surprising result, since our previous report shows that the majority of domestically produced wheat-flour brands at retail level are not using elemental iron to fortify; nearly all listed ferrous fumarate or ferrous sulphate as the iron source. Assuming the information on the labels of retail flours is correct, this raises the question as to why the wheat flour supplied to bread and tortilla manufacturers is fortified with the cheaper,

and less effective, elemental iron. Moreover, it indicates that food manufacturers are not checking that the flour they buy to make their products is fortified with recommended iron types.

Where our analysis shows mainly *red* categories indicating low scores on the levels of iron and zinc, this suggests the flour used in making the bread or tortilla product may not be fortified at all. Some examples of these products include: all tortilla products by Mi Reina; Soriana's *tortilla de maiz nixtamillado*; Bimbo's soft *trigo blanca*; Mission's *tortillas de maiz amarillas*; Tortilleria del Barrio's *tortilla de harina*; La Comer's *tortilla de maiz*; Walmart's Great Value *pan blanco*; and Butter Krust's *bollos*.

Overall, there were very few good examples, indicating that food manufacturers are not checking that the flour they buy to make their products is fortified adequately in line with the law. It is clear that the majority of industrially produced breads and tortillas on sale in Mexico are not adequately fortified, and therefore that the flour-fortification programme is not having the intended benefits for the population.

4.2 Bread results

As Table 2 shows, most bread products are made using flour that has been fortified to some extent, but did not clearly meet the iron and zinc levels mandated in the flour-fortification regulation. Our results give only six out of 43 bread products (14%) a green rating, meaning they were found to be fortified with both iron and zinc levels above 40mg per kg. These products were Bimbo's Pan Blanco Sin Orillas; Chedraui's white baguette; Costco's Kirkland Signature *white bolillo*; and three over-the-counter bread products from Soriana.

Two Lecaroz products (*bolillo* and *bolillo integral*) contained sufficient quantities of iron but not enough zinc, while a further ten products contained sufficient levels of zinc but not enough iron. Interestingly, Bimbo, the world's largest bakery company with over a third of its sales in Mexico, had some of the lowest levels of iron and zinc present in its bread products.

Questions need to be asked about products with very low levels of iron that also appear to be fortified using a less-bioavailable form of iron, as it is extremely doubtful whether these products are providing the intended benefit for people in Mexico. Examples of these products include: Bimbo's Wonder *super pan blanco*; Filler's *pan blanco tipo europeo*; Superama's *bolillo frances*; and Walmart's Great Value *pan blanco*.

Out of all 43 bread products tested, none were fortified with the recommended type of iron *and* the right quantities of iron and zinc. This is an important find, as it not only goes against what should be happening if the flour-fortification programme was operating according to the law, but it also goes in the opposite direction to the practices of companies and supermarkets with regard to the flours on sale at retail level. Our previous report showed that the majority of flours available at retail level list ferrous fumarate or ferrous sulphate as the iron source used in the fortification process. This report exposes that, even when flours that use the recommended iron source are available, manufacturers are not used them to make bread products. Sometimes the same company follows different fortification practices within the same brand; for example, Walmart's Great Value white wheat flour says on the label it is fortified using ferrous fumarate, but Walmart's Great Value *pan blanco* is made using a less-bioavailable elemental iron type. These findings could indicate that food manufacturers are procuring flour from other countries, such as the US, where flour is fortified to different standards.

Serious questions are raised about six products (Mr Dely's *pan blanco*, Butter Krust's *bollos*, Bimbo's *pan blanco artesano*, Sanissimo's *pan sin gluten*, and Oroweat's 7 *Granos* and *mantequilla* breads), for which tests found very low levels of iron and zinc and did not detect elemental iron. Given the low levels of iron and zinc present in these products, we strongly suspect they have been made using flour that has not been fortified at all.



TABLE 2: Results for bread products

BRAND	PRODUCER/TRADER/ OWNER	PRODUCT NAME	TYPE OF FLOUR	TOTAL ANALYSED	ELEMENTAL IRON DETECTED	IRON LOWER BOUND	IRON	IRON UPPER BOUND	ZINC LOWER BOUND	ZINC	ZINC UPPER BOUND
GRUPO BIMBO	GRUPO BIMBO	PAN BLANCO SIN ORILLAS	BLANCO	9	9	41	53	66	43	57	70
GRUPO BIMBO	GRUPO BIMBO	PAN BLANCO	BLANCO	10	10	38	50	61	40	52	65
GRUPO BIMBO	GRUPO BIMBO	RINDE	BLANCO	5	5	32	42	51	27	36	44
EL GLOBO	GRUPO BIMBO	BAGUETTE	BLANCO	6	6	29	38	47	36	47	58
EL GLOBO	GRUPO BIMBO	CIABATTA	BLANCO	4	4	25	33	40	32	41	51
¡ANÍSSIMO	GRUPO BIMBO	PAN SIN GLUTEN	TAPIOCA, MAIZE, POTATO, RICE FLOUR	4	0	23	30	37	22	29	36
GRUPO BIMBO	GRUPO BIMBO	CERO CERO	INTEGRAL	10	n/a	22	29	36	27	35	43
WONDER	GRUPO BIMBO	SUPER PAN BLANCO	BLANCO	9	9	21	27	33	31	41	50
OROWEAT	GRUPO BIMBO	7 GRANOS	MEZCLA TRIGO (BLANCO E INTEGRAL), CENTENO Y OATMEAL	8	0	20	26	32	27	35	44
GRUPO BIMBO	GRUPO BIMBO	PAN BLANCO ARTESANO	BLANCO	11	0	20	26	32	23	31	38
OROWEAT	GRUPO BIMBO	MANTEQUILLA	BLANCO	10	0	20	25	31	27	35	44
cuesta menos	cuesta menos	BAGUETTE	BLANCO	6	6	41	53	66	52	69	85
cuesta menos	cuesta menos	BOLILLO	BLANCO	9	9	31	41	50	37	48	59
KIRKLAND Signature	COSTCO WHOLESALE	BOLILLO	BLANCO	1	1	41	53	65	43	56	70
KIRKLAND Signature	COSTCO WHOLESALE	BAGUETTE	TRIGO Y CEBADA	2	1	39	51	62	49	65	80
Elizondo	Elizondo	BOLILLO	BLANCO	3	0	29	37	46	36	47	58
CANADIAN BAGELS	EUROBAGEL	BAGEL	TRIGO Y CEBADA	4	4	27	35	43	34	44	55
Miller	Miller	PAN BLANCO TIPO EUROPEO	BLANCO	5	5	24	31	38	29	39	48
Butter-Krust	FlowersFoods	BOLLOS	TRIGO Y CEBADA	4	n/a	22	28	34	10	13	15
la Comer	la Comer	BOLILLO	BLANCO	4	4	39	51	63	42	55	69
la Comer	la Comer	PAN DE CAJA BLANCO	BLANCO	5	5	34	44	54	34	45	55
Esperanza	Esperanza	BOLILLO	BLANCO	5	5	33	43	53	40	52	65

TABLE 2: Results for bread products

BRAND	PRODUCER/TRADER/ OWNER	PRODUCT NAME	TYPE OF FLOUR	TOTAL ANALYSED	ELEMENTAL IRON DETECTED	IRON LOWER BOUND	IRON	IRON UPPER BOUND	ZINC LOWER BOUND	ZINC	ZINC UPPER BOUND
Esperanza	Esperanza	BLANCO DE CAJA	BLANCO	6	6	25	33	40	30	40	49
Espiga	Espiga	BOLILLO	BLANCO	3	3	35	46	56	42	55	68
LECAROZ	LECAROZ	BOLILLO INTEGRAL	INTEGRAL	1	n/a	47	61	75	37	48	60
LECAROZ	LECAROZ	BOLILLO	BLANCO	6	6	40	52	64	38	50	62
LECAROZ	LECAROZ	TELERA	BLANCO	1	1	39	51	62	39	52	64
LECAROZ	LECAROZ	PAN MICRO	BLANCO	1	1	38	49	60	43	57	70
LECAROZ	LECAROZ	BLANCO	BLANCO	5	5	27	36	44	29	38	47
Mr. Dely	Mr. Dely	PAN BLANCO	TRIGO Y CEBADA	6	n/a	23	30	37	10	12	15
NEW YORK BAGEL & BAGEL	NEW YORK BAGEL & BAGEL	BAGEL	BLANCO	8	8	34	45	55	29	38	47
	NEW YORK BAGEL & BAGEL	PAN BLANCO	BLANCO (CON SALVADO)	4	n/a	33	43	53	25	33	41
Soriana	Soriana	BAGUETTE	BLANCO	4	4	52	68	84	67	89	110
Soriana	Soriana	PAN FRANCES BOLILLO	BLANCO	5	5	48	62	76	62	82	102
MEGA Soriana	Soriana	BOLILLO	BLANCO	6	6	40	52	64	50	66	82
MEGA Soriana	Soriana	PAN FENDU	BLANCO	1	1	37	48	60	43	57	70
MEGA Soriana	Soriana	PAN TELERA	BLANCO	1	0	37	48	59	42	56	69
MEGA Soriana	Soriana	BAGUETTE	BLANCO	5	2	26	34	42	35	46	57
Walmart	Walmart	BOLILLO	BLANCO	7	4	35	45	55	43	57	71
Walmart	Walmart	BAGUETTE	BLANCO	6	2	32	42	51	43	57	71
Aurrera	Walmart	BAGUETTE	BLANCO	4	4	31	40	49	35	46	57
Superama	Walmart	BOLILLO FRANCES	BLANCO	1	1	23	30	37	26	34	41
Great Value	Walmart	PAN BLANCO	TRIGO Y CEBADA	5	5	21	27	34	8	11	13

4.3 Tortilla results

As Table 3 shows, from the 69 tortilla products tested, only one (Bimbo's Milpa Real *tortilla con nopal y linaza*) was given a green rating, meaning it contained levels of both iron and zinc above 40mg per kg. This means only 1.5% of tortillas products tested in this study were considered to meet the minimum requirements outlined in the flour-fortification regulations. However, it is not clear whether this product is made using flour fortified with a recommended soluble type of iron, or whether it has high levels of iron from other added ingredients.

Only two other products (Walmart's Aurrera *tortilla taquera* and Chedraui's *tortilla nopalinaza*) contained adequate levels of iron *and* appeared to be using a recommended type of iron. However, these two products lacked sufficient levels of zinc. Meanwhile, on the levels alone, only 11 products out of 69 (17%) contained sufficient quantities of iron but not enough zinc.

Our results also detected elemental iron in 84% of products, showing that the flour used to make both wheat- and maize-based tortillas is not being fortified with the recommended type of iron, according to the fortification regulations. For maize-based tortillas this aligns with our previous investigations, which showed that the majority of nixtamalized maize flours are fortified using electrolytic iron, which is recommended by neither the Mexican standards nor the WHO guidelines.

For wheat-based tortillas, as with bread products, there is a marked difference between the type of iron used in wheat flours available at retail level (ferrous fumarate or ferrous sulphate) and the type of iron used in wheat-based tortillas (elemental iron). Again, a prime example of this is Walmart, whose Great Value white wheat flour says on the label it is fortified using ferrous fumarate but whose *tortillas de harina de trigo* is made using a less-bioavailable elemental iron.

Questions should be asked of companies with products containing very low levels of iron and zinc (10-20 mg/kg), including products from brands owned by Gruma (Mission's *tortillas de maíz amarillas* and tortillas de harina estilo casero, and Tortilleria de Barrio's *tortillas de harina*), Bimbo (soft *tortilla blanca*) and Soriana (*tortilla de maíz nixtamalizado*). Products that appear to be fortified with elemental iron but present with extremely low levels of both iron and zinc (below 10mg per kg) also raise serious questions. Notably, this includes all six tortilla products we tested from the Mi Reina brand. This suggests that only part of the flour used to make the product has been fortified, or that fortification has taken place at extremely low levels.

Similar to the bread product results, our findings show that the majority of tortillas are fortified to some extent, but nowhere near sufficiently. Our findings could indicate that manufacturers are buying flour from the US, where flours are fortified with elemental iron but not zinc. But wherever manufacturers are procuring flour to make their products, one thing is clear: It is not compliant with Mexican fortification standards.

TABLE 3: Results for tortilla products

BRAND	PRODUCER/OWNER/ TRADER	PRODUCT NAME	WHEAT / MAIZE	TYPE OF FLOUR	TOTAL ANALYSED	ELEMENTAL IRON DETECTED	IRON LOWER BOUND	IRON	IRON UPPER BOUND	ZINC LOWER BOUND	ZINC	ZINC UPPER BOUND
Abarrey	Abarrey	TORTILLA DE HARINA	TRIGO	BLANCA	2	2	36	47	58	11	15	18
Mi Reina	ALIMENTOS TIPICOS MEXICANOS GAVI SA DE CV	TORTILLAS DE HARINA DE TRIGO 25g	TRIGO	BLANCA	5	5	24	31	38	24	31	39
Mi Reina	ALIMENTOS TIPICOS MEXICANOS GAVI SA DE CV	TORTILLAS DE HARINA DE TRIGO 15g	TRIGO	BLANCA	3	3	20	26	32	24	31	38
Milpa Real	GRUPO BIMBO	TORTILLAS CON NOPAL Y LINAZA	MAIZ	BLANCA	8	0	50	66	81	54	70	87
Del Hogar	GRUPO BIMBO	TORTILLAS DE HARINA DE TRIGO INTEGRAL	TRIGO	INTEGRAL	1	n/a	31	40	49	28	37	46
Tia Rosa	GRUPO BIMBO	TORTILLINAS INTEGRALES	TRIGO	INTEGRAL	5	n/a	30	39	48	28	37	46
Tia Rosa	GRUPO BIMBO	TORTILLAS DE HARINA PARA PARRILLA	TRIGO	BLANCA	10	3	26	34	41	25	33	41
Del Hogar	GRUPO BIMBO	TORTILLAS DE HARINA DE TRIGO	TRIGO	BLANCA	11	3	26	34	42	26	35	43
Tia Rosa	GRUPO BIMBO	TORTILLINAS PRECOCIDAS	TRIGO	BLANCA	7	3	24	31	38	23	30	38
Tia Rosa	GRUPO BIMBO	TORTILLINAS CON MANTEQUILLA	TRIGO	BLANCA	9	0	23	30	37	26	34	42
Tia Rosa	GRUPO BIMBO	TORTILLINAS 12 PZAS	TRIGO	BLANCA	7	3	22	28	35	22	30	37
Tia Rosa	GRUPO BIMBO	MAX	TRIGO	BLANCA	4	2	21	28	34	26	34	42
Tia Rosa	GRUPO BIMBO	TORTILLINAS 22 PZAS	TRIGO	BLANCA	8	3	20	26	33	22	29	36
Tia Rosa	GRUPO BIMBO	TORTILLINAS LIGERAS	TRIGO	BLANCA	10	7	19	24	30	22	29	37
GRUPO BIMBO	GRUPO BIMBO	SOFT	TRIGO	BLANCA	9	7	14	18	23	20	26	32
Chedraui cuesta menos	Chedraui cuesta menos	TORTILLA TAQUERA	MAIZ	BLANCA	1	1	54	70	86	37	49	60
Chedraui cuesta menos	Chedraui cuesta menos	TORTILLA AMARILLA	MAIZ	AMARILLO	4	4	48	63	77	33	43	54

TABLE 3: Results for tortilla products

BRAND	PRODUCER/OWNER/ TRADER	PRODUCT NAME	WHEAT / MAIZE	TYPE OF FLOUR	TOTAL ANALYSED	ELEMENTAL IRON DETECTED	IRON LOWER BOUND	IRON	IRON UPPER BOUND	ZINC LOWER BOUND	ZINC	ZINC UPPER BOUND
CHEDRAUI cuesta menos	CHEDRAUI cuesta menos	TORTILLA NOPALINAZA	MAIZ	BLANCA	1	0	42	54	67	30	40	50
CHEDRAUI cuesta menos	CHEDRAUI cuesta menos	TORTILLA BLANCA	MAIZ	BLANCA	5	4	36	46	57	27	36	44
Selecto	CHEDRAUI cuesta menos	TORTILLA DE HARINA	TRIGO	BLANCA	2	2	29	38	47	32	42	52
Señor Cactus	Deli DIPS & SNACKS	TORTILLAS CON NOPAL	MAIZ	BLANCA	7	0	14	19	23	20	27	33
mission	gruma	TORTILLAS DE MAIZ DELGADITAS	MAIZ	BLANCA	7	7	35	45	56	28	37	46
mission	gruma	TORTILLAS DE HARINA INTEGRALES	TRIGO	INTEGRAL	5	n/a	24	32	39	22	29	36
mission	gruma	WRAPS	TRIGO	BLANCA	5	5	23	29	36	33	43	53
mission	gruma	TORTILLAS DE HARINA SABOR MANTEQUILLA	TRIGO	BLANCA	10	10	21	28	34	28	37	46
mission	gruma	TORTILLAS DE HARINA ESTILO CASERO	TRIGO	BLANCA	10	10	19	25	31	15	20	24
Del Barrio	gruma	TORTILLAS DE HARINA	TRIGO	BLANCA	5	1	14	18	23	15	20	25
mission	gruma	TORTILLAS DE MAIZ AMARILLAS	MAIZ	AMARILLO	3	0	11	14	17	13	16	20
Mi Reina	GRUPO SAN TITO SA DE CV	INTEGRAL	TRIGO	INTEGRAL	2	n/a	16	20	25	18	23	29
Mi Reina	GRUPO SAN TITO SA DE CV	TORTILLAS DE HARINA DE TRIGO ORIGINALES 12 PZAS	TRIGO	BLANCA	6	5	5	6	8	5	7	8
Mi Reina	GRUPO SAN TITO SA DE CV	TORTILLAS DE HARINA DE TRIGO CERO GRASA	TRIGO	BLANCA	10	6	5	6	7	5	7	9
Mi Reina	GRUPO SAN TITO SA DE CV	GUACAMOLE	TRIGO	BLANCA	5	4	5	6	8	5	7	8
Mi Reina	GRUPO SAN TITO SA DE CV	MANTEQUILLA	TRIGO	BLANCA	2	2	5	6	8	5	7	8
Mi Reina	GRUPO SAN TITO SA DE CV	TORTILLAS DE HARINA DE TRIGO ORIGINALES 22 PZAS	TRIGO	BLANCA	4	3	4	5	6	5	7	8
OvarB	INDUSTRIAS OVARB SA DE CV	SOPES	MAIZ	BLANCA	7	0	14	18	23	20	27	33

TABLE 3: Results for tortilla products

BRAND	PRODUCER/OWNER/ TRADER	PRODUCT NAME	WHEAT / MAIZE	TYPE OF FLOUR	TOTAL ANALYSED	ELEMENTAL IRON DETECTED	IRON lower bound	IRON	IRON upper bound	ZINC lower bound	ZINC	ZINC upper bound
La Tortilla Reforma	JUAN CARLOS PAREDES SOTO	TORTILLAS DE HARINA	TRIGO	BLANCA	1	1	30	40	49	31	41	51
La Tortilla Reforma	JUAN CARLOS PAREDES SOTO	TORTILLAS DE HARINA GORDITAS	TRIGO	BLANCA	1	1	29	38	47	30	40	50
La Tortilla Reforma	JUAN CARLOS PAREDES SOTO	TORTILLAS DE HARINA TAQUERA	TRIGO	BLANCA	1	1	29	38	47	30	40	50
Nopalia	KUA	TORTILLAS CON NOPAL	MAIZ	BLANCA	6	1	31	40	49	28	37	46
Nopalia	KUA	TORTILLAS CON NOPAL Y LINAZA	MAIZ	BLANCA	5	1	29	38	47	26	34	42
laComer	laComer	TORTILLA TAQUERA	MAIZ	AMARILLO	2	1	42	55	67	29	38	48
laComer	laComer	TORTILLA AMARILLA	MAIZ	AMARILLO	2	2	33	43	53	24	31	39
laComer	laComer	TORTILLA DE MAIZ	MAIZ	BLANCA	2	0	19	25	30	16	21	26
DEL TIGRE	n/a	TORTILLA DE HARINA	TRIGO	BLANCA	1	1	32	42	52	32	43	53
OCHOA	OCHOA	SOPES	MAIZ	BLANCA	9	1	25	32	40	21	27	34
OCHOA	OCHOA	TORTILLAS DE MAIZ	MAIZ	BLANCA	3	2	20	26	32	17	22	27
OCHOA	OCHOA	TORTILLAS TAQUERAS	MAIZ	BLANCA	6	1	20	26	32	21	27	34
DORIS	PRODUCTOS ALIMENTICIOS JANETTE SA DE CV	TORTILLAS DE HARINA	TRIGO	BLANCA	3	3	35	46	56	28	37	46
EL SOL		TORTILLAS DE HARINA	TRIGO	BLANCA	3	3	29	38	47	31	41	51
Becarel	RENE ROMERO BERNAL	TORTILLAS DE HARINA	TRIGO	BLANCA	1	1	28	36	45	27	35	43
Becarel	RENE ROMERO BERNAL	TORTILLAS DE HARINA GORDITAS	TRIGO	BLANCA	1	1	25	33	41	24	32	40
Soriana	Soriana	TORTILLA TAQUERA	MAIZ	BLANCA	3	3	43	57	70	31	41	51
Soriana	Soriana	TORTILLA DE MAIZ BLANCA	MAIZ	BLANCA	3	3	41	53	65	29	38	47

BRAND	PRODUCER/OWNER/ TRADER	PRODUCT NAME	WHEAT / MAIZE	TYPE OF FLOUR	TOTAL ANALYSED	ELEMENTAL IRON DETECTED	IRON lower bound	IRON	IRON upper bound	ZINC lower bound	ZINC	ZINC upper bound
MEGA	Soriana	TORTILLA DE MAIZ AMARILLO	MAIZ	AMARILLO	4	2	40	52	64	27	35	43
MEGA	Soriana	TORTILLA DE MAIZ	MAIZ	BLANCA	5	5	38	50	62	29	38	48
MEGA	Soriana	TORTILLA DE MAIZ CON NOPAL	MAIZ	BLANCA	2	0	37	48	59	26	34	42
MEGA	Soriana	SOPES	MAIZ	BLANCA	5	2	37	48	59	23	31	38
MEGA	Soriana	TORTILLA TAQUERA	MAIZ	BLANCA	4	0	34	44	55	25	32	40
Soriana	Soriana	TORTILLA DE MAIZ NIXTAMALIZADO	MAIZ	BLANCA	4	4	16	21	26	14	18	23
SUSAETA	SUSAETA	TORTILLAS MAIZ CON NOPAL	MAIZ	BLANCA	9	8	30	39	48	29	38	47
TIRIXCOM	TIRIXCOM	TORTILLAS DE HARINA TAQUERA	TRIGO	BLANCA	2	2	31	41	50	30	40	49
Superama	Walmart	TORTILLA DE MAIZ	MAIZ	AMARILLO	2	2	49	63	78	29	38	48
Aurrera	Walmart	TORTILLA TAQUERA	MAIZ	BLANCA	2	0	45	59	72	24	32	39
Walmart	Walmart	TORTILLA DE MAIZ AMARILLA	MAIZ	AMARILLO	2	1	44	58	71	29	39	48
Superama	Walmart	TORTILLA DE MAIZ	MAIZ	BLANCA	6	6	43	56	69	31	41	51
Walmart	Walmart	TORTILLA DE MAIZ BLANCA	MAIZ	BLANCA	4	4	34	44	54	25	34	42
Great Value	Walmart	TORTILLAS DE HARINA CON SALVADO DE TRIGO	TRIGO	INTEGRAL	5	n/a	30	39	48	31	41	51
Aurrera	Walmart	TORTILLA DE MAIZ	MAIZ	BLANCA	3	0	22	29	35	26	34	43
Great Value	Walmart	TORTILLAS DE HARINA DE TRIGO	TRIGO	BLANCA	14	13	21	27	33	23	31	38

5. Company scores

Our investigation and testing covered popular brands of bread produced by 15 different companies and popular brands of industrially made tortillas produced by 20 different companies. Some of the biggest companies own several different brands; for example, in addition to the Bimbo brand, Grupo Bimbo produce breads under the Sanissimo, Oroweat and Wonder brands, as well as owning the El Globo bakery chain. In this section, we take a closer look at the biggest bread and tortilla companies, and highlight some of the

TABLE 4: overall results of largest bread companies

PRODUCER/TRADER/OWNER	BRANDS	NUMBER OF PRODUCTS TESTED	NUMBER OF PRODUCTS ELEMENTAL IRON DETECTED	PROPORTION OF PRODUCTS ELEMENTAL IRON DETECTED	NUMBER OF PRODUCTS CLEARLY WELL FORTIFIED (IRON)	NUMBER OF PRODUCTS CLEARLY WELL FORTIFIED (ZINC)	RECOMMENDATIONS
Grupo Bimbo	Grupo Bimbo, El Globo, Sanissimo, Wonder, Oroweat	11	6	Half or more	1	2	Make sure all flour is fortified with right type of iron sources. Use flour in your products fortified with right quantities of iron and zinc.
Soriana	Soriana, MEGA	6	5	Half or more	3	5	Make sure all flour is fortified with right type of iron sources. Ensure flour supplied is fortified with right quantities of iron.
Walmart	Walmart, Aurrera, Superama, Great Value	5	5	ALL	0	2	Switch to flour fortified with right type of iron sources. Ensure flour supplied is fortified with right quantities of iron and zinc.
Chedraui	Chedraui	2	2	ALL	1	1	Switch to flour fortified with right type of iron sources. Ensure flour supplied is fortified with right quantities of iron and zinc.
La Comer	La Comer	2	2	ALL	0	1	Switch to flour fortified with right type of iron sources. Use flour in your products fortified with right quantities of iron. Ensure flour supplied is fortified with right quantities of zinc.

Companies	GRUPO BIMBO	gruma	Walmart	Soriana	CHEDRAUI cuesta menos	laComer
Annual revenue	USD **15.1** bn[36]	USD **3.9** bn[41]	USD **32.5** bn[44]	USD **8** bn[48]	USD **6.4** bn[50]	USD **1** bn[53]
Market share	25% market share in baked goods[37]	25% share of tortilla market[42]	12% share of retail market[45]	3.4% share of retail market[49]	3rd largest food retailer in mexico[51]	1.6% share of retail market[54]
Location	Mexico City	San Pedro Garza García, Nuevo León	Mexico City	Monterrey, Nuevo León	Xalapa, Veracruz	Mexico City
Employees	129,000	20,600	219,000	95,000	50,750	10,800
Brands	Tía Rosa, Del Hogar, WONDER, EL GLOBO, SANISSIMO, OROWEAT	MISSION, DELICADOS, GUERRERO, Calidad and Rositas	Walmart, Great Value, Aurrera	MEGA Soriana, Member's choice, Soriana, menúsolutions	Selecto, CHEDRAUI cuesta menos	laComer, GOLDEN HILLS, Ke Precio

COMMITMENTS ON NUTRITION / FORTIFICATION

Grupo Bimbo claims that 99% of its portfolio gives nutritional information and is 100% compliant with regulations.[38]

—

Mentions the importance of micronutrients on its website. Bimbo claims its product portfolio (including breads) is fortified with nutrients and minerals.[39]

—

The company has set goals to achieve by 2020, which state they will "develop 2 fortified/enriched products aimed for the vulnerable population annually, starting actions in Mexico and Latin America as part of the fight against undernourishment".[40]

There is no mention of nutrition or fortification policies in Gruma's annual report, despite Gruma's website stating that nutrition is one of their key pillars of social sustainability: "[w]e produce a food staple with high nutritional value for the general health and welfare of our consumers".[43]

Company website lists sustainability "aspirations" for 2025, such as reducing sodium, added sugars and saturated fat where possible, and working to remove certified synthetic colours and artificial flavours in products "where customers don't expect to find them". The website does not specify Walmart's fortification polices.[46]

—

Its Financial and Corporate Responsibility Report (2017) says the company increased the offering of healthy products at Superama stores, but there is no mention of fortification.[47]

No nutritional policy was found on the website, nor did its Annual Report of 2017 mention anything about nutritional or fortification efforts.

"The Chedraui Foundation contributes to the well-being of the most vulnerable sectors of the country through actions to support health, housing, nutrition and social welfare".[52] No mention of other nutrition-related or fortification policies.

No nutritional/fortification policy found

OUR RESULTS

12 TORTILLA PRODUCTS TESTED:

Only one contained adequate levels of iron and zinc.

—

Most wheat flour-based tortillas had much lower levelsof iron and zinc than levels mandated by the flour-fortification law.

—

More than half of tortilla products appear to contain the less-bioavailable elemental iron.

7 TORTILLA PRODUCTS TESTED:

None of the products reached adequate levels of iron and zinc.

—

The quantities were much lower than many other companies, with many products not reaching half the amounts outlined in the flour regulation.

8 TORTILLA PRODUCTS TESTED:

4 products had adequate iron levels but contained lower levels of zinc than levels mandated by the flour-fortification regulation.

—

Over half the products appear to contain elemental iron.

8 TORTILLA PRODUCTS TESTED:

3 products contained adequate levels of iron, but none contained adequate levels of zinc.

5 TORTILLA PRODUCTS TESTED:

3 products contained the required iron levels, but none had adequate levels of zinc.

3 TORTILLA PRODUCTS TESTED:

None of the products contained adequate levels of zinc, and only one had sufficient levels of iron.

11 BREAD PRODUCTS TESTED:

Only one bread product contained sufficient quantities of both iron and zinc – Bimbo's Pan Blanco Sin Orillas – but this appears to contain elemental iron, which is not recommended in the flour-fortification regulations.

—

Nine products did not meet required levels of both iron and zinc, and one product did not meet required levels of iron.

—

More than half of Bimbo's bread products appear to contain elemental iron.

5 BREAD PRODUCTS TESTED:

2 products reached the required levels of zinc; however, none reached the necessary levels of iron.

—

All products appear to contain the less-bioavailable elemental iron.

6 BREADS PRODUCTS TESTED:

3 products were adequately fortified with both iron and zinc, and an additional 2 products contained adequate levels of zinc.

—

All appeared to contain the less-bioavailable elemental iron.

2 BREAD PRODUCTS TESTED:

The white baguette contained adequate levels of iron and zinc, but did not appear to be fortified with the recommended type of iron.

2 BREAD PRODUCTS TESTED:

The bolillo contained adequate levels of zinc, but neither product contained sufficient levels of iron.

Spotlight on the biggest companies

TABLE 5: overall results of largest tortilla companies

PRODUCER/TRADER/ OWNER	BRANDS	NUMBER OF PRODUCTS TESTED	NUMBER OF PRODUCTS ELEMENTAL IRON DETECTED	PROPORTION OF PRODUCTS ELEMENTAL IRON DETECTED	NUMBER OF PRODUCTS CLEARLY WELL FORTIFIED (IRON)	NUMBER OF PRODUCTS CLEARLY WELL FORTIFIED (ZINC)	RECOMMENDATIONS
Grupo Bimbo	Bimbo, Tía Rosa, Milpa Real, Del Hogar	12	8	Half or more	1	1	Make sure all flour is fortified with right type of iron sources. Use flour in your products with the right levels of iron and zinc.
Soriana	Soriana, Mega	8	6	Half or more	3	0	Make sure all flour is fortified with right type of iron sources. Use flour in your products with the right levels of iron and zinc.
Walmart	Walmart, Aurrera, Superama, Great Value	8	5	Half or more	4	0	Make sure all flour is fortified with right type of iron sources and at the right levels. Use flour in your products with the right levels of zinc.
Chedraui	Chedraui, Cuesta Menos	5	4	Half or more	3	0	Make sure all flour is fortified with right type of iron sources and at the right levels. Use flour in your products with the right levels of zinc.
La Comer	La Comer	3	2	Half or more	1	0	Make sure all flour is fortified with right type of iron sources. Use flour in your products with the right levels of iron and zinc.
Gruma	Mission, Guerrero	7	5	Half or more	0	0	Make sure all flour is fortified with right type of iron sources. Use flour in your products with the right levels of iron and zinc.
Soriana	Soriana	3	3	ALL	0	0	Switch to flour fortified with right type of iron sources and with the right levels of iron and zinc.
SAN TITO	Mi Reina	6	5	Half or more	0	0	Make sure all flour is fortified with right type of iron sources. Use flour in your products with the right levels of iron and zinc.

wider trends in their approach to fortifying the products they sell in Mexico. As tables 4 and 5 show, there are very few green categories, meaning that none of the largest food processors or supermarket retailers are performing well when it comes to ensuring the flour they use to make their products is fortified in line with the law.

For bread producers, only Soriana obtained a green score; this was because five out of its six products tested contained levels of zinc clearly above the minimum requirements in the flour fortification regulation. However, only half of their products held sufficient quantities of iron. This was a better score than most other companies. In comparison, none of the 5 Walmart bread products and only 1 of the 11 Bimbo bread products we tested contained levels of iron which clearly comply with the flour-fortification standard. Furthermore, all bread products we tested from Walmart, Chedraui and La Comer are likely to contain elemental iron – a less-bioavailable source of iron. This is the exact opposite of these supermarkets' practices regarding the wheat flours they sell at retail level. According to package labels, their wheat flours at retail level contain ferrous fumarate or ferrous sulphate – the recommended and more easily absorbed form of iron. This raises the crucial question of why these supermarkets are making breads with wheat flour that contains the cheaper, and less effective, elemental iron.

For tortilla producers, none of the biggest companies scored *green* for having a high proportion of products that clearly contained levels of iron and zinc that met the minimum requirements outlined in the flour-fortification regulations. Bimbo had the only product with adequate levels of both iron and zinc; however, this was out of 12 products we tested across their various different brands. Walmart and Chedraui had the highest proportion of products with adequate levels of iron. Notably, none of the seven products we tested from Gruma – a multinational tortilla-manufacturing company – contained adequate levels of iron or zinc. This is a puzzling finding, given that our previous tests on Gruma-owned Maseca maize flour revealed the company is adding electrolytic iron to its flours at levels two to three times higher, on average, than the levels recommended in the fortification regulation for ferrous salts. The discrepancy between the levels of iron and zinc in Gruma's maize flour compared to their tortilla products raises questions.

These are multi-billion-dollar companies with significant experience in food processing. Bimbo is a bakery giant whose sales in Mexico increased by over 12% in 2016. Likewise, Gruma is a world leader in maize-flour production, with 18 processing plants and facilities in research and food technology for the production of flour and tortillas.[55] Furthermore, the law on the fortification of flours for sale in Mexico is not a new development; it has been in place for many years. It is not only the flour millers that have a moral responsibility for tackling micronutrient deficiencies; food processors also play a vital role in the delivery of micronutrients through adequately fortified products. There is no good reason for these corporate giants to sidestep their responsibility, and no excuse for their failure to procure flours that are adequately fortified to the legal standards.

6. Conclusions

Fortification is an important tool for addressing micronutrient deficiencies – but only when it is implemented properly. It is clear from this investigation that food processors and supermarkets in Mexico are not buying and using adequately fortified flour in the production of breads and tortillas. Although the majority of breads and tortillas we tested are fortified to some extent, only 14% of breads (6 out of 43 products) and 1.5% of tortillas (1 out of 69 products) clearly met the iron and zinc levels mandated in the flour-fortification regulation.

This includes products from large multinational companies with significant experience in food processing, such as Bimbo and Gruma. Only one out of 11 Bimbo bread products and one out of 12 Bimbo tortilla products contained levels of both iron and zinc which met the minimum requirements outlined in the flour-fortification regulations. This is despite the company claiming to be concerned about micronutrient deficiencies and stating it has "*used [white bread] as a means to carry important nutrients such as iron, zinc and vitamin A*".[56] We found that out of the seven tortilla products tested in our study from Gruma, which produces the Mission brand of tortillas, none contained adequate levels of iron or zinc – despite Gruma stating that: "*[w]e produce a food staple with high nutritional value for the general health and welfare of our consumers*".[57]

This is evidently a weak point in the chain, which the new government in Mexico has an opportunity to mend by updating the fortification regulations to cover breads and tortillas, thus closing the loophole. Our results show that companies cannot be trusted by themselves to procure adequately fortified flour for use in making flour-rich products, such as breads and tortillas. Although adequately fortified flour is not widely available at the retail level, it might be even less commonly used at a bulk-wholesale level, since test results on wheat flour-based products indicate that most companies are not using the recommended type of iron. This is an important finding: It is at odds with what should be happening if the flour-fortification programme were operating according to the law, and is in opposition to the practices of companies and supermarkets regarding the wheat flours they sell at retail level.

Bread and tortilla producers play a critical role in the delivery of essential micronutrients through adequately fortified products. These food manufacturers therefore have a responsibility to put in place specifications for procuring fortified flour and robust systems to check whether this is happening, and keep good records to show they are using adequately fortified flour. Food processors have a moral responsibility to help address micronutrient deficiencies and deliver good nutrition to people in Mexico. Since many of the companies investigated in this report are multi-billion-dollar food giants, they have no excuse not to step up and play a bigger role in demanding and providing adequately fortified products.

7. Recommendations

Government

- Close the loophole by updating the Mexican regulation (NOM-247-SSA1-2008) to state that wheat and maize flours fortified to the Mexican standard must be used in the preparation of industrially produced tortillas, breads and other flour-rich products.
- Set a requirement for the minimum quantity of iron, zinc and other micronutrients to be added to breads and tortillas, which should correspond to the flour fortification standard and be proportional to the flour in the product.
- Update the regulation to make it a requirement for manufacturers to include information about the levels and compounds of added micronutrients on the labels of bread and tortilla products.
- Ensure the flour-fortification programme is properly monitored and enforced, and that the data is publicly available and accessible to civil society, consumers and industry.

Food processors and supermarkets

- Each company should ensure they have a policy and specifications in place to procure fortified flour, in line with national Mexican standards, and should demand adequately fortified flour from their suppliers.
- Food processors should have robust systems in place for regularly checking and testing the flours used in food production to make sure they meet the Mexican fortification standards.
- Food processors should maintain documentation on procurement and use of fortified flours and make this available for inspection by government officials.

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