

Sodium content in processed foods in Argentina: compliance with the national law

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Background: Despite the body of evidence that documents the unfavorable effects of excessive sodium consumption on blood pressure and cardiovascular health, public health efforts to decrease sodium consumption have been limited to a few countries. Argentina is the first country in Latin America to regulate sodium content of processed foods by means of a national law. The objective of this cross-sectional quantitative study is to provide a baseline comparison against the reduction targets set by the national law before its entry into force.

Methods: Data were collected in February 2014 in a leading supermarket chain located in Buenos Aires. Nutrient data from package labels were analysed for 1,320 products within 14 food groups during the study period. To compare sodium concentration levels with the established maximum levels we matched the collected food groups with the food groups included in the law resulting in a total of 292 products. Data analysis was conducted using SPSS version 20 software.

Results: Food groups with the highest median sodium content were sauces and spreads (866.7 mg/100 g), meat and meat products (750 mg/100 g) and snack foods (644 mg/100 g). Categories with the highest sodium content were appetizers (1,415 mg/100 g), sausages (1,050 mg/100 g) and ready-made meals (940.7 mg/100 g). We also found large variability within products from the same food categories. Products included in the national law correspond to 22.1% (n=292) of the surveyed foods. From the 18 food groups, 15 showed median sodium values below the established targets. Products exceeding the established maximum levels correspond to 15.1% (n=44) of the products included in the analysis.

Conclusions: This study is the first analysis of food labels to determine sodium concentrations of processed foods in Argentina and to provide a baseline against the national law standards. Upon the completion of this analysis, maximum levels have been achieved by most of the food groups included in the law. Thus, the introduction of further reductions for the existing maximum levels and the establishment of sodium targets for all relevant product categories not included in the law should be considered as the next steps in the process.

Keywords: Sodium reduction; processed foods; public health policies; Argentina; Latin America

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Introduction

There is compelling evidence of the close relationship between excess sodium intake, raised blood pressure and cardiovascular diseases (CVD) (1-4). In fact, excess sodium intake has been reported to cause 3.1 million deaths 5.6% of premature deaths and 2.4% of disability (62 million

DALYs) globally (4-6). In Argentina, CVD is the first cause of death in the general population with 94,099 deaths per year (7). According to a study conducted in Argentina about the burden of disease attributable to cardiovascular risk factors, 37% of all cardiovascular deaths are attributable to hypertension (8). Furthermore, data from the National Risk

Factor Survey showed that 34.1% of the adult population is hypertensive (9). Sodium intake is also estimated to be at least double of the World Health Organization (WHO) recommendation of 2,000 mg/day (10) as it is the case of other countries (11-14) in the region. According to data from the National Ministry of Health (MoH), salt consumption per person is approximately 12 g/day (15).

The main source of sodium intake comes from processed foods (4,16) with a small proportion coming from the salt added during preparation or at the table as it has been estimated in developed countries (17,18). In Argentina, estimations from the MoH indicate that between 65% and 70% of dietary sodium intake comes from processed foods (10).

Sodium reduction policies are cost-effective and efficient in reducing the global burden of CVD (19,20) and improving the health of the general population (21). As has been the case of developed countries such as Finland and the United Kingdom that have promoted sodium reduction strategies and are already documenting reductions in dietary sodium intake (22-24), similar public health policies are needed in developing countries to achieve similar goals in order to prevent and reduce CVD and non-communicable diseases (NCD). In fact, the cost-effectiveness of preventive interventions to reduce CVD (25), cost-utility of salt reduction (26) and the feasibility of sodium reduction in processed foods in Argentina (10) have already been documented. As it has been estimated in a cost-utility analysis conducted in Argentina, a reduction of 3 grams of salt in the Argentinean diet would result in a 24.1% reduction in the incidence of heart disease, 21.6% reduction in acute myocardial infarction and 20.5% reduction in stroke cases. The intervention would also reduce mortality rates from heart disease in 19.9% (26).

The Argentinean government has shown leadership in engaging the food industry in a reformulation effort. In 2011, the MoH signed a voluntary agreement (27) with large food companies to gradually and progressively reduce sodium content in processed foods.

According to the food group and category, reductions vary between 5% and 18% over the maximum levels in a period of two years. This has been achieved under an initiative called *Menos Sal Más Vida* (Less Salt More Life) (28) that has the purpose of lowering sodium consumption in the general population in order to meet the WHO recommendation of a daily intake of 5 g of salt per person by 2020. Furthermore, the creation in 2011 of the Healthy Argentina Program (Programa Argentina Saludable), the Cardiovascular Disease Prevention Program (Programa de

Prevención de Enfermedades Cardiovasculares) and the National Commission on Prevention of NCDs (Comisión Nacional para la Prevención de Enfermedades Crónicas No Transmisibles) are milestones in Argentina's public health policy arena regarding the prevention of NCD (27).

More recently, in December 2013, Argentina passed a sodium reduction law (Act 26905) which entered into force in December 2014, becoming one of the first countries in the region to regulate sodium content in processed foods. The law includes gradual reductions similar to the values set in the voluntary agreement (between 5% and 18% of reduction) in three main food groups and other two main measures regarding education campaigns to the general population and a restaurant strategy (restriction of salt shakers and low-sodium menus) (29).

This study is part of a comprehensive research strategy to monitor sodium reduction policies in Argentina. The qualitative analysis of the policy process has been published elsewhere. The objective of this study is to determine the baseline sodium levels of processed foods in Argentina provided by food labels and to compare our results with the maximum levels set in the national law. This quantitative analysis was conducted to provide a baseline comparison against the reduction targets set by the National Law before its entry into force.

Methods

Study design

This is a cross-sectional study design to obtain baseline sodium content information months before the entry into force of the national law by means of a systematic survey of the nutritional information of processed foods in Argentina and to compare these sodium levels with the maximum levels set in the national law. This study is part of the "The Food Monitoring Group" initiative to monitor the nutritional content of processed foods worldwide (30,31). The Argentinean component is a comprehensive research strategy that also includes the qualitative analysis of sodium reduction policies and the chemical analysis of a sample of breads (32).

Data collection

Data were collected in February 2014 in a leading supermarket chain according to market share information (33). Data collection was conducted by a member of the research

team on-site. In order to obtain permission to access the supermarket, a formal letter was sent and approval from the supermarket officials was obtained. Each product was surveyed using the data collector application (34) developed by The George Institute. This process included the scanning of the bar code of each product and taking three photographs (front of the package, ingredients list, and nutritional information panel). This information was then uploaded and entered into The George Institute's branded food composition database (35) according to standardized methodology (30). For each product, manufacturer, brand and product name, serving size and the complete nutritional information per 100 g or 100 mL was entered.

Definitions of food groups and categories

Food groups and categories were defined using the classification system of The George Institute (30) and adapted to the food products available in Argentina. Food groups were defined according to the set of food products that use the same raw material and have similar nutritional content (e.g., bread and bakery products, dairy products, etc.). Food categories included products with the same manufacturing process (e.g., biscuits, bread, etc., within the bread and bakery products groups) (36,37). The final food categorization system included 14 food groups: bread and bakery products, cereals and cereal products, dairy products, meat and meat products, fish and derivatives, snacks and appetizers, fast food, oil emulsion dressings, sauce products and spreads, beverages, canned vegetables and fruit, ice cream, chocolate and seasonings. These groups were also classified into 40 categories.

For the comparison of the surveyed products with the national law we matched the food groups and categories from our database with those food groups and categories included in the national law. The law includes three main food groups: meat and meat products, farinaceous and soups, seasonings and canned food. Within these groups, 19 product categories are included: cooked, dry and ready-to-eat sausages, luncheon meat, processed poultry, bran crackers, crackers, snacks crackers, snacks, dry sweet biscuits, filled sweet biscuits, whole meal bread, white bread, frozen bread, bouillon cubes and granulated soup, clear soup, cream soup and instant soup.

Data analysis

In order to characterize the distribution of the data set in

each food group and category, median values were used as they are robust measures of central tendency and they are less sensitive to extreme values. The mean and the range were added as a reference, as well as percentile 25 and percentile 75. The coefficient of variation as index of dispersion was also calculated.

To compare sodium concentration levels with the established maximum levels we matched the collected food groups with the food groups included in the law resulting in a total of 292 products that could be compared. The comparison in *Table 1* was made between the median values and the targets established by the law. In the same table, we added a column to show how the median of sodium concentration for the products analyzed are above or below the established targets. This showed how close or how far the median values were when compared with the established targets. The difference between the median values is showed in percentages and it was calculated as follows: $[1 - (\text{median}/\text{target})] \times 100$. A positive value shows that the median values of the products are below the target and a negative value shows that the median is over the target established by law. Data analysis was conducted using SPSS version 20 software.

Results

Sodium content

Data collection included 1,655 products surveyed. Nutrient data from package labels was analyzed for 1,320 products within 14 food groups during the study period (*Table 2*). We excluded the products in which sodium content or serving size was not available as these two values allow the calculation of sodium content per 100 g.

From the total number of products, most products were bread and bakery products (18.5%), convenience foods (13.6%), dairy products (cheese) (12.9%), and beverages (11.1%), cereal and cereal products (10%), sauces and spreads (8.8%), snack foods (8.1%), meat and meat products (6.1%) and other products (11%). The number of products in the different food groups ranged from 19 (oil products and oil emulsions) to 241 (bread and bakery products) (*Table 2*).

Food groups with the highest median sodium content were sauces and spreads (866.7 mg/100 g), meat and meat products (750 mg/100 g), dairy products (cheese) (653.3 mg/100 g) and snack foods (644 mg/100 g). Confectionery (chocolate) (76 mg/100 g), ice creams (61.1 mg/100 g) and beverages

Table 1 Sodium content in the food products included in the national law (n=292)

Food groups	Products	Max. values: sodium mg/100 g	N of prod.	Sodium mg/100 g			N of prod. above the target	Median % above/under the target (%)
				Mean	Median	Range		
Meat and meat products	Cooked sausages and salt-cured cooked products with and without stuffing. It includes: mortadella, sausages, cooked ham and blood sausage	1,196	17	833.2	944.0	135-1,077.3	0	21
	Dried salami, sausages and soppressata	1,900	10	1,336.2	1,491.3	320-2,005	1	22
	Fresh sausages	950	4	1,041.0	1,070.0	922-1,102	3	-13
	Hamburgers	850	17	720.0	695.8	609.6-950	1	18
	Breaded chicken group: nuggets, bouchées, patynitos, supremes, medallions and chicken shapes	736	7	515.1	526.2	226.9-709.2	0	29
	Crackers with bran	941	2	275.2	275.2	7-543.3	0	71
	Crackers without bran	941	9	566.3	510.0	309.4-1,036.7	1	46
Farinaceous	Snack crackers	1,460	17	873.8	788.4	187.1-1,800	1	46
	Snacks	950	16	767.5	762.0	180-1,056	5	20
	Dry sweet cookies	512	69	225.0	225.0	0-538.7	1	56
	Filled sweet cookies	429	38	171.3	146.7	0-436.7	1	66
	Bakery products without bran	530	13	506.8	546.0	50-770	7	-3
	Bakery products with bran	501	46	456.6	492.0	0-883.3	23	2
	Frozen bakery products*	527					0	
	Bouillon cubes and granulated soup	430	9	352.1	388.8	33.2-415.2	0	10
	Clear soups	346	3	313.2	303.2	301.6-334.8	0	12
	Cream soups	306	6	258.8	280.7	140-300	0	8
Dry soups	352	9	239.3	248.8	174-292.4	0	29	

* , although this category is included in the law, we did not find products belonging to this group in the products surveyed.

Table 2 Sodium content of processed foods in the different food groups in Argentina (n=1,320)

Food group	N of Prod.	Sodium mg/100 g and 100 mL					
		Mean	Median	Range	%ile 25	%ile 75	CV* (%)
Edible oils and oil emulsions	19	347.9	240.0	140-720	140.0	570.0	62
Beverages (non-alcoholic)	145	18.7	16.0	0-191	7.0	21.0	119
Meat and meat products	79	849.8	750.0	65.1-2,550	650.0	1,050.0	50
Cereal and cereal products	131	277.5	203.3	0-991.2	41.2	447.5	91
Chocolates	22	100.4	76.0	28.6-240	39.3	164.3	71
Convenience foods	178	422.2	340.75	0-3,610	115.0	593.3	107
Canned fruits and vegetables	35	163.5	163.9	0-550	8.5	239.2	90
Ice cream**	40	67.9	61.1	5.2-174	54.6	72.8	40
Dairy products (cheese)	169	703.5	653.3	13.3-1,576.7	480.0	933.3	51
Bread and bakery products	241	335.6	283.3	0-1,283.3	166.7	475.0	69
Fish and fish products	26	357.2	311.65	44-954	173.3	490.0	60
Sauces and spreads	115	1,089.4	866.7	0-5,510	553.3	1,016.7	91
Snack foods	106	795.3	644.0	3.6-2,940	500.0	852.0	70
Condiments***	14	10,961.9	10,111.1	0-21,680	7376	16,560	58.3

*, coefficient of variation; **, ice creams are defined as a separate group from dairy as in the Argentinean Food Guide they are included in the "sweet and sugar" group. This is because they have a high proportion of sugar in their composition; ***, condiments (defined as an additive used during cooking to give food a particular flavor) showed a high sodium concentration when reported per 100 g. If reported considering a mean serving size of 5.9 g this would result in a median sodium content of 596.5 mg.

(16 mg/100 mL) had the lowest mean sodium content. Within the food groups, the categories with the highest median sodium content were appetizers (1,415 mg/100 g), sausages (1,050 mg/100 g) and ready-made meals (940.7 mg/100 g) (Table 3). Categories with the lowest median sodium content included canned fruits (0 mg/100 g), non-alcoholic beverages (16 mg/100 g) and pasta (55 mg/100 g) (Table 3).

We found large variability within products from the same food categories. Coefficients of variation for all the food groups ranged from 119% to 40%. Beverages (range, 0-191 mg/100 g; CV: 119%), convenience foods (range, 0-3,610 mg/100 g; CV: 107%), sauces and spreads (range, 0-5,510 mg/100 g; CV: 91%), cereal and cereal products (range, 0-991.2 mg/100 g; CV: 91%) and canned fruits and vegetables (range, 0-550 mg/100 g; CV: 90%) showed the highest variability in sodium contents (Table 2). Within the different food categories, we found the highest variations in canned fruit (range, 0-5.9 mg/100 g; CV: 283%), pasta (range, 0-991.2 mg/100 g; CV: 120%), non-alcoholic beverages (range, 0-191 mg/100 g; CV: 119%), canned herring (range, 148.3-681.7 mg/100 g; CV: 90%) and pre-

cooked meals (range, 17.6-1,508 mg/100 g; CV: 90%) (Table 3).

Comparison of baseline sodium levels against targets set by National Act 26905

Products included in the groups selected in the national law correspond to 22.1% (n=292) of the surveyed foods (Table 1). For the 18 food categories included in the law, the number of products varied from 69 in the dried sweet cookies to two in the crackers without bran category. Products with the highest median sodium contents were dried salami, sausage and soppressata (1,491.3 mg/100 g), fresh sausages (1,070 mg/100 g), cooked sausages and salt-cured cooked products with and without stuffing (944 mg/100 g) and snack crackers (788.4 mg/100 g). Filled sweet cookies (146.7 mg/100 g), dried sweet cookies (225 mg/100 g), dry soups (248.8 mg/100 g) and crackers with bran (275.2 mg/100 g) are the categories with the lowest median sodium contents.

We also found large variability within products from the same food categories included in the law. Crackers with bran (range, 7-543.3 mg/100 g), filled sweet cookies (range,

Table 3 Sodium content in the different food categories in Argentina (n=1,306)

Food group	Category	N of Prod.	Sodium mg/100 g					CV* (%)
			Mean	Median	Range	%ile 25	%ile 75	
Edible oils and oil emulsions	Butter	6	160.0	140.0	140-260	140.0	140.0	31
	Margarine	13	434.6	470.0	200-720	200.0	650.0	48
Beverages	Non-alcoholic beverages	145	18.7	16.0	0-191	7.0	21.0	119
Meat and meat products	Sausages	41	1,033.2	1,050.0	135-2,550	884.0	1,200.0	50
	Processed poultry	7	515.1	526.2	226.9-709.2	350.8	698.5	35
	Hamburgers	17	720.0	695.8	609.6-950	675.4	750.6	12
	Others	3	431.9	533.3	65.1-697.3	65.1	697.3	76
	Spreads	11	693.6	700.0	590-750	650.0	750.0	8
Cereals and cereal products	Cereal bars	11	178.9	175.0	73.9-305.2	126.1	208.0	37
	Breakfast cereal	49	308.1	212.5	7-900	80.0	510.0	82
	Pasta	54	236.9	55.0	0-991.2	15.0	410.0	120
	Soy-based products	17	381.9	402.4	28-653.4	306.3	456.5	40
Chocolates	Alfajores	22	100.4	76.0	28.6-240	39.3	164.3	71
Convenience Foods	Bouillon cubes	9	352.1	388.8	33.2-415.2	375.6	400.0	34
	Pancakes	6	408.9	406.7	363.3-500	363.3	413.3	12
	Pizzas	18	505.4	551.6	155.2-880	329.6	600.0	41
	Ready-made meals	8	993.4	940.7	190-1,750	891.8	1,170.0	44
	Pre-cooked meals	26	380.7	289.4	17.6-1,508	115.4	542.5	90
	Instantaneous desserts	36	82.1	79.6	18.2-206.7	44.9	109.6	51
	Pre-mixtures	28	559.4	449.2	18.3-1,215	410.0	666.7	52
	Soups	18	258.2	265.8	140-334.8	248.5	294.0	20
	Puff pastry for empanadas	9	618.6	635.7	15-1,014.3	634.8	722.2	43
	Puff pastry for pies	10	624.7	655.0	413.3-750	510.0	716.7	18
Canned fruit and vegetables	Frozen vegetables	10	751.1	55.9	0-3,610	29.0	304.0	190
	Canned fruits	8	0.7	0.0	0-5.9	0.0	0.0	283
	Canned vegetables	27	211.8	211.7	8.5-550	150.0	254.6	63
Ice creams	Ice creams	40	67.9	61.1	5.2-174	54.6	72.8	40
Dairy products	Cheese	169	703.5	653.3	13.3-1,576.7	480.0	933.3	51
Bread and bakery products	Biscuits	125	243.9	225.0	0-1,036.7	133.3	310.0	72
	Bread	38	485.6	492.0	50-630	444.0	542.0	20
	Bakery products	53	387.1	300.0	19-1,283.3	211.7	496.7	75
	Toast	25	456.8	573.3	0-883.3	112.0	680.0	65
Fish and derivatives	Canned tuna	8	346.3	311.7	238.3-534	251.7	435.9	33
	Breaded fish	7	302.3	280.8	149.2-584.6	149.2	509.2	59
	Others	8	424.7	360.2	44-954	246.2	593.6	70
	Canned herring	3	334.4	173.3	148.3-681.7	148.3	681.7	90
Sauces and spreads	Seasonings	96	1,228.1	933.3	0-5,510	730.0	1,070.9	83
	Sauces	19	389.0	516.7	6.5-633.3	208.3	533.3	54
Snacks and appetizers	Appetizers	18	1,451.6	1,415.0	394-2,940	680.0	1,610.0	60
	Snacks	88	661.1	607.4	3.6-2,384	500.0	794.2	52

* , coefficient of variation. This table does not include the food group condiments (n=14).

0-436.7 mg/100 g), dried cookies (range, 0-538.7 mg/100 g) and bakery products with bran (range, 0-883.3 mg/100 g) had the highest sodium content variations against clear soups (range, 301.6-334.8 mg/100 g), fresh sausages (range, 922-1,102 mg/100 g), hamburgers (range, 609.6-950 mg/100 g) and dry soups (range, 174-292.4 mg/100 g) with the lowest sodium level variations (*Table 1*).

From the 18 food groups, 15 showed median sodium values below the established targets. We found that 50 out of 55 products (90.9%) from the meat and meat product food group, 171 out of 210 farinaceous (81.4%) and 27 out of 27 (100%) soups, dressings and canned foods had median sodium levels below the established targets. In the case of filled sweet cookies (n=38), for instance, median sodium concentration was 146.7 mg/100 g, while the maximum sodium level was established in 429 mg/100 g. This shows that the median value is 66% below the established target (*Table 1*).

Products exceeding the established maximum levels correspond to 15.1% (n=44) of the products included in the analysis (n=292). The number of products ranged from one (e.g., dried sausages, hamburgers, crackers, etc.) to 23 (bakery products without bran). In the bakery products without bran category, even when the median is below the established target, we found 23 products (n=46) that do not comply with the maximum levels being the category with the highest number of products exceeding the current established levels. This category also showed an important sodium level variability (range, 0-883.3 mg/100 g) (*Table 1*). In the case of bakery products with bran (n=13), the median sodium concentration is 3% above the established maximum level.

Discussion

Despite the body of evidence that documents the unfavorable effects of excessive salt consumption on blood pressure and cardiovascular health, public health efforts to decrease sodium consumption have been limited to a few countries. Argentina is the first country in Latin America to regulate sodium content of processed foods by means of a national law.

This study is the first analysis of food labels to determine sodium concentrations of processed foods in Argentina and to provide a baseline against the national law standards. This will be an essential input for future comparisons. The methodology used in this study and the use of our findings could also be used in other countries in the region to

promote sodium reduction strategies in light of the recently published Regional Targets for Salt Reduction in the Americas by the Pan American Health Organization (38). Furthermore, the database will be updated regularly in order to better evaluate the progress of the current reformulation policy in our country.

As shown in other studies (39-42), one of the major findings of this analysis is that sodium concentrations vary significantly within the same food group and category. Similar findings were also found in a previous pilot study conducted in our country (36) using the same methodology. This shows that technical feasibility of having lower sodium food products in the market is achievable and that gradual and progressive reductions can be expected.

On the other hand, as it has already been agreed, prevention of CVD is essential to reduce premature mortality in our region. The sodium reduction law (National Act 26905) is a very important step forward in the prevention of CVD in Argentina, as well as in the rest of the Latin American countries who implement similar strategies (32). In our analysis, several months before the law entered into force, most products from the food groups included in the law are already below the established maximum levels showing that further reductions could be promoted in the short term. In fact, high compliance with the law at the moment of entering into force shows that the reduction targets had already been set in the voluntary agreement signed between the MoH and the food industry (27). As in the voluntary agreement the food industry was mainly represented by big companies who had already been working to achieve these targets, the enactment of this law may not have implied a big challenge for these companies. However, unlike the voluntary agreement, the current legislation reaches all the food companies (36) including small and medium food enterprises located throughout the Argentinean territory. Although this is a very positive aspect of the new legislation that will cover all the selected food products, it will be essential to implement effective monitoring mechanisms to the guarantee the universal compliance of the law, especially concerning small and medium enterprises.

One of the strengths of this legislation is the fact that the MoH has full authority to set new progressive and gradual reduction targets and to include new food categories. This is a very significant aspect as on the one hand, the law does not cover all the food groups that contribute to the sodium consumption of the Argentinean population and on the other, sodium content in the food groups included in the

law is still high to achieve the WHO recommendation of 2,000 mg per day. As shown in our results, variability in the sodium content of these products shows that reductions are feasible and can be achieved in the near future.

Although this law constitutes an important step forward in the prevention of CVDs in our country, dietary sodium intake at the population level remains high (9), showing that the challenge ahead will be to guarantee the full implementation of the current law, to promote progressive and gradual reduction targets, especially for larger companies that have already achieved the current targets, and to continue with the efforts to add new food categories. Also, it is important to consider that reformulation efforts should be accompanied by other comprehensive policies to promote healthy nutrition in the general population such as the promotion of clear front-of-packaging labeling information, marketing of unhealthy foods targeted to children and policies to increase availability of fruits and vegetables, among others.

The present study will be used as an independent tool to monitor future changes in sodium content in processed foods marketed in our country. Also, our data will not only facilitate analysis over time, but also provide information for comparisons among the different countries participating in The Food Monitoring Group.

One of the most important limitations of our study is that we could not cover the complete food products available in the Argentinean market, especially those from small and medium enterprises. However, data collection in different areas of the country will be conducted in the future to include these products.

Conclusions

In conclusion, this baseline assessment of the median sodium content of processed foods provides valuable information on the development of a sodium reduction law in Argentina and allows objective and independent monitoring of the implementation of the law.

Upon the completion of this analysis, maximum levels have been achieved by most of the products surveyed. Thus, the introduction of further reductions for the existing maximum levels and the establishment of sodium targets for all relevant product categories not included in the law should be considered as the next steps in the process.

This national sodium reduction legislation could have an enormous potential to prevent CVD, guaranteeing the effective implementation of this policy which, together with

discussion to add new targets and categories, should be a national public health priority.

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