

Special Article – Food Disorders

Food Patterns, Diabetes and Overweight/Obesity and Some Socio-Economic Indicators in the Italy Regions

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Introduction

The purpose of this study is to identify the differences in mortality due to type 2 diabetes (T2D), the increase of overweight and obesity in the different regions of Italy and their relation with change in dietary patterns within the framework of some economic indicators.

In Italy in 2015, the total adult population (1000s) (20-79 years) were 44,704; the prevalence of diabetes in adults (20-79 years) was 7.9%. The number of deaths in adults due to this disease was 22,226. Cost per person with diabetes (USD) was 3,450.1. The number of undiagnosed cases of this disease in adults was (1000s) 1,324.3 [1].

According to the International Diabetes Federation (IDF) the overall prevalence of T2D in 2015 was 8.8%, of which approximately 75% were people living in low and middle-income countries. The fastest increase of cases occurred in regions where the economy moved from low to middle-income. In low and middle-income regions, the number of people with diabetes will increase 150% over the next 25 years. Moreover, 318 million people live with impaired glucose worldwide. The IDF calculated that in the same year about 46.5% (193 million) patients were undiagnosed worldwide and one in seven births was affected by gestational diabetes. The disease caused 5 million deaths and resulting in 673 billion dollars being spent on care [2].

In 2015, 415 million people had diabetes worldwide. More than 59.8 million of those were in the EUR Region and over 3.5 million cases (adults 20-79 years) were in Italy [2].

In this regard, structural social determinants should be considered, covering a wide and complex combination of socio-economic conditions and interacting cultural and other environmental elements. The conditions in which the population is born, grows, lives, works, and ages, as well as the type of systems used to combat the disease are those that determine inequality and social inequity. Political and economic forces in each region in turn influence these conditions [3]. Analysis of health problems using social determinants is a framework of reference for research in various areas of public health and epidemiology. The field of knowledge and purpose of the DSS is to analyze inequities in the distribution of social goods and how avoidable inequalities are manifested in the state of health of social groups [4-6].

Economic development has led to greater availability and diversity of the food in almost all countries and a gradual decrease in food shortages, resulting in nutritional condition. There have also been improved living standards and increased access to services. However, these improvements differ between countries with low, medium and high income and between population groups within each country [7].

In this context, research in recent years on epidemiology and other population based scientific fields has helped the understanding of the role of dietary patterns and their relation with socio-economic conditions and non-communicable diseases. In short, we have identified some specific food components that increase the probability of disease. Available data provide a solid and plausible foundation on the relationship of diet with some diseases. Thus it is known that diet is crucial as a social determinant of chronic diseases [8-15].

The election of behaviours such as meal choice is related to “collective life styles” and understanding that the life styles are not individual decisions, but conducts influenced by the opportunities defined by the social environment in which individuals live. People’s behaviour is socially imposed, and their ability to freely choose what to eat, for example, is dependent on income, marketing and availability [16,17]. Today, even in the most remote locations, products have displaced the traditional diet. This reflects the lack of control in the market and is a policy that has encouraged the consumption of processed foods harmful to health [8].

Dietary changes along with decreased energy expenditure, sedentary life, mechanized transport, labor saving appliances in the home workplace and a preferences in leisure time for computer games requiring no physical effort, have given rise to the so-called “Nutritional Transition”. This transition is characterized by changes in both the quantity and type of food [18-20].

Due to changes in eating habits and way of life, the NCDs, including obesity, diabetes mellitus, cardiovascular diseases, hypertension, cerebrovascular accidents and some types of cancer, are increasingly causes of disability and premature death in both developing and newly developed areas, especially among the poor [21].

Methods

Using data on health conditions from the health conditions “Health for All” [22] database, we analyzed the mortality rate of diabetes from 1990 to 2014 and the proportion of people with overweight and obesity from 2002 to 2013 by regions: Italy, North, Central, South and Islands. The European database “Health for All” provides a selection of indicators for the 53 member countries of WHO Europe.

Reviewing and analyzing data from the Food Balance Sheet (FBS), produce annually by the Food and Agriculture Organization (FAO), we organize in decades the information available of kcalpercapita per day (kcal/per/day from 1961 to 2013) of the most frequent foods [23].

The variation in prices of fruit, vegetables, sugar, chocolate, sweets and sugary drinks was analysed, from 2002 to 2013, employing the “Consumer Price Index for the whole nation” [24] (base 95 = 100) in terms of average annual percentage changes. Index in relation to the population present in the country and to the set of all goods and services purchased by households with an actual market price by reference to a base year: 1995.

With the data on “Final consumption expenditure of resident and non-residents households on the economic territory” (chained values-2010) [24] the average annual expenditure on the following foods was calculated: bread and cereals, meat, fish and seafood, milk,

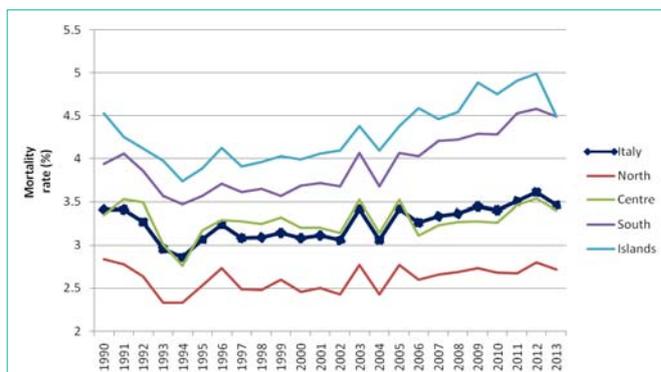


Figure 1: Mortality rate (%) for diabetes type 2. Source: Constructed by the authors from the Health for All Database (HFA-DB), WHO/Europe.

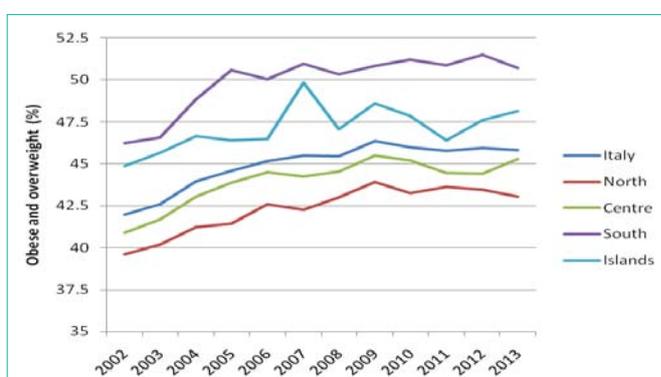


Figure 2: Obese and overweight people (%). Source: Constructed by the authors from the Health for all Database, WHO Europe.

cheese and eggs, vegetable oils and animal fats, fruit, vegetables, cakes, sugar and chocolate and sugary drinks. Actual values in chained prices were constructed values with the so-called chaining methodology, in which the basis for the calculation of the actual values is changed in each period. *Chaining* involves building a series of real values, where each value is calculated using the previous year’s prices, but later in the rebuilding. Using the annual percentage rates of change, an entire time series is reported in a single year of arbitrary reference, so that the values of several years become comparable. The concatenated indices are opposed to so-called fixed-base indices, where the base year is kept constant for a certain number of periods (Real values at constant prices).

Average monthly expenditure for sugar was calculated in the different areas of the country [25]. Finally, Gross Domestic Product (GDP) [26] per capita was calculated at market prices (chained values with reference year 2010 and percentage changes). GDP is a monetary measure of the market value of all final goods and services produced in a period. Per capita values are average values obtained by comparing the economic aggregates (such as GDP, household final consumption, value added, compensation of employees) to the number of inhabitants or variables relating to labour input. The Ginico efficient for each region was calculated. This is a measure of the deviation of the distribution of income among individuals or households within a country from a perfectly equal distribution. A value of 0 represents absolute equality, a value of 100 absolute inequalities [27-29].

Table 1: Dietary patterns according to general food groups in kcal/person/day. Italy 1961-2013.

Period Kcal/day	1961-1973 3252.6		1974-1986 3452.8		1987-1999 3567.8		2000-2013 3611.6	
	Kcal/day	%	Kcal/day	%	Kcal/day	%	Kcal/day	%
Food groups/ Total								
Cereals - excluding beer	1317.2	40.5	1230.4	35.6	1143.1	32.0	1141.9	31.6
• Wheat	1212.5	37.3	1144.5	33.1	1054.1	29.5	1047.4	29.0
Food of animal origin	576.1	17.7	804.2	23.3	926.6	26.0	929.8	25.7
• Meat	220.7	6.8	332.7	9.6	395.4	11.1	386.9	10.7
• Milk	204.5	6.3	261.8	7.6	268.0	7.5	281.6	7.8
• Eggs	38.8	1.2	44.7	1.3	47.3	1.3	46.1	1.3
• Fish, Sea food	23.5	0.7	27.6	0.8	39.8	1.1	47.6	1.3
Animal fats/veget oil	498.7	15.3	637.4	18.5	777.0	21.8	801.4	22.2
• Animal fats	81.3	2.5	127.2	3.7	164.6	4.6	157.9	4.4
• Vegetable Oils	417.4	12.8	510.2	14.8	612.4	17.2	643.6	17.8
- Olive oil	233	7.4	268	7.7	294	8.3	299.5	8.3
- Soy oil	37	1.2	109	3.1	109	3.1	116.2	3.2
- Sunfloweroil	24	0.8	21	0.6	81	2.3	99.0	2.7

Source: Constructed by the authors from the Food Balance Sheets FAO. United Nations for Food and Agriculture. Statistical Databases. URL: <http://faostat.fao.org> 1961-2013.

Results

Diabetes

Between 1990 and 2013, national mortality rates for diabetes did not vary greatly. There were some oscillations with the rate going from 3.41 to 3.46. In the 1990s the rate fell in relation to previous years, and from 2005 this rate showed a slight but steady increase. The southern region shows a continuous increase from 3.9 to 4.49. The central region showed a similar trend to the general mortality rate. The northern region had the lowest rates and in the islands the highest mortality rates of diabetes were observed for the whole period analyzed, as shown in the (Figure 1).

Overweight and obesity

In Italy between 2002 and 2007 overweight and obesity showed a steady increase, which stabilized from 2008. A similar pattern was observed in various areas except the islands that showed some oscillations. The percentage of overweight and obese people throughout the study period was higher in the southern region and lower in the north with a difference of 7.6% on average and a slight increase during the period. With respect to Italy as a whole this statistical difference is smaller (about 5%) although remarkable (Figure 2). The differences are also important between Islands and the North, on average about 4.8%. Overweight and obesity are related to the trend of the diabetes mortality rate, as is shown in (Figure 3), where the tendency of both series is very similar suggesting a link between the mortality rate from diabetes and overweight and obesity.

Dietary patterns

The food groups that showed the most apparent consumption were cereals, food of animal origin and vegetable oils. All contributed more than 70% of the total kcal/per/day. The increase during the period was 360 kcal/per/day. Cereals, in particular wheat, showed a decline, whereas the other groups increased. Apparent consumption of food of animal origin between 1961 and 2013 rose 8% and vegetable oils and animal fat sat 7% (Table 1).

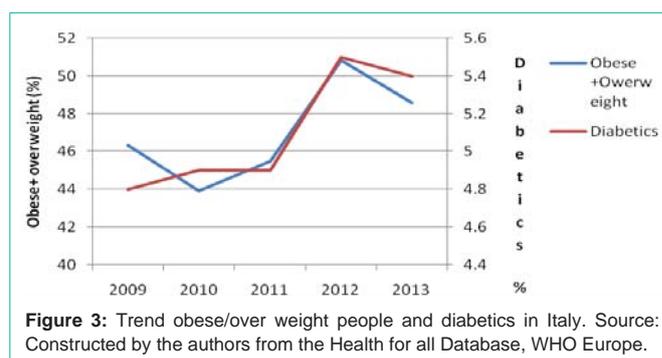


Figure 3: Trend obese/over weight people and diabetics in Italy. Source: Constructed by the authors from the Health for all Database, WHO Europe.

Among foods of animal origin, meat showed the greatest increase and contributed a higher proportion of kcal/per/day, followed by milk, which had a slight but steady increase. Eggs showed minimum changes while the increased for fish almost doubled.

Vegetable oils, particularly olive oil, contributed a significant number of kcal/pers/day to the diet of the Italians. However, from 1974 and 1987, soy oil and sunflower respectively showed an importantly increased in availability (Table 1).

The next food groups were sugar and sweeteners, alcoholic beverages, fruits, vegetables, roots and tubers and legumes (Table 2).

It is noteworthy that sugar and alcoholic beverages consumption declined from the mid 1980s. Wine declined almost twofold, while the apparent consumption of beer increased nearly threefold.

Apparent consumption of fruits and vegetables showed slight increase. There was greater availability of apples, followed by grapes and oranges. Similarly "other" indicates diversity.

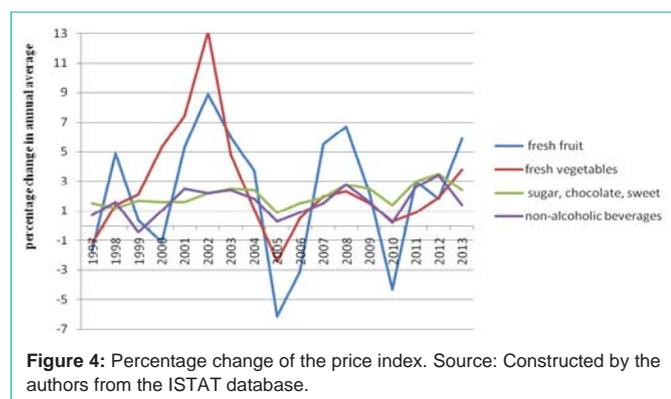
Consumption of vegetables remained virtually unchanged over the period. However, tomatoes were consumed the most. The category "other" showed diversity in this food group.

Tubers (potatoes) showed a small decrease in availability.

Table 2: Dietary patterns according to the general food groups in kcal/person/day. Italy 1961-2013.

Period/Kcal/day	1961-1973 3252.6		1974-1986 3452.8		1987-1999 3567.8		2000-2013 3611.6	
	Kcal/per/day	%	Kcal/per/day	%	Kcal/per/day	%	Kcal/per/day	%
Food groups								
Sugar & Sweeteners	282.5	8.7	310.5	9.0	291.0	8.2	294.9	8.2
Alcoholic Beverages	234.9	7.2	204.2	5.9	149.6	4.2	121.9	3.4
• Wine	207.5	6.4	207.4	6.0	109.8	3.1	76.1	2.1
• Beer	14.1	0.4	14.6	0.4	31.8	0.9	38.3	1.1
Fruits - Excl Wine	154.3	4.7	141.7	4.1	157.2	4.4	182.9	5.1
• Others	7.3	0.2	7.4	0.2	12.5	0.4	14.4	0.4
• Apple	31.0	1.0	30.7	0.9	29.2	0.8	24.8	0.7
• Grape	25.2	0.8	25.1	0.7	21.1	0.6	34.4	1.0
• Orange and mandarins	19.6	0.6	20.1	0.6	31.8	0.9	42.0	1.2
Vegetables	90.4	2.8	98.3	2.8	104.1	2.9	99.8	2.8
• Others	7.3	0.2	7.3	0.2	7.0	0.2	6.4	0.2
• Tomatoes	19.5	0.6	19.5	0.6	30.3	0.8	26.1	0.7
Roots and tuber	84.7	2.6	71.2	2.1	73.8	2.1	69.4	1.9
• Potato	83.5	2.6	82.6	2.4	73.6	2.1	68.9	1.9
Legume	50.9	1.6	34.6	1.0	48.6	1.4	50.5	1.4
• Others	3.2	0.1	3.1	0.1	10.0	0.3	12.0	0.3
• Beans	22.8	0.7	22.6	0.7	14.1	0.4	15.9	0.4

Source: Constructed by the authors from the Food Balance Sheets FAO. United Nations for Food and Agriculture. Statistical Databases. URL: <http://faostat.fao.org> 1961-2013



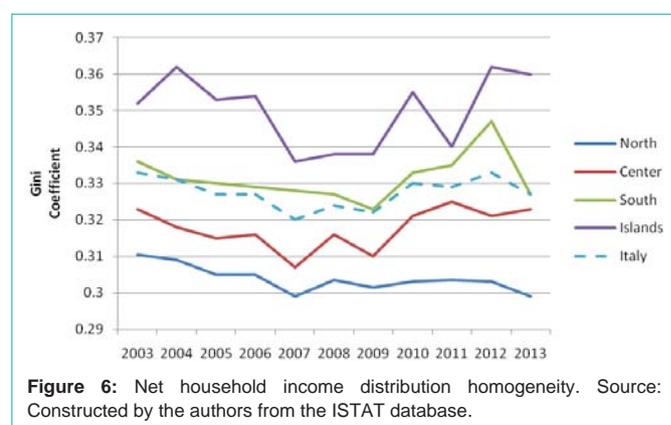
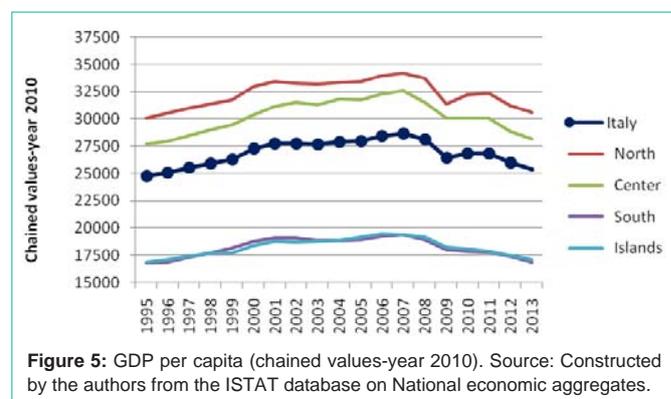
Legumes also shown slight decline, while the major contribution came from the beans. The “other” category reflects diversity in the apparent consumption.

Food prices variations

Whit regard to the “Consumer Price Index for the Whole Nation”, fruit and vegetables have shown great price oscillations during the period, in particular since 2010 when they register a growing trend. The prices of sweet packaged food and sugary drinks on the other hand, remained stable and generally lower than previous years with a tendency to decrease in the last two years (Figure 4).

Considering instead the entire decade 2000-2013 beyond the annual trend, the overall prices rice of fruit and fresh vegetables is more evident, whereas sweets, chocolate and soft drinks are characterized by downward variations (Table 3).

The reduction in real GDP *per capita*, which has occurred



since the 2009 crisis (Figure 5), has affected the whole of Italy but particularly the South and the Islands.

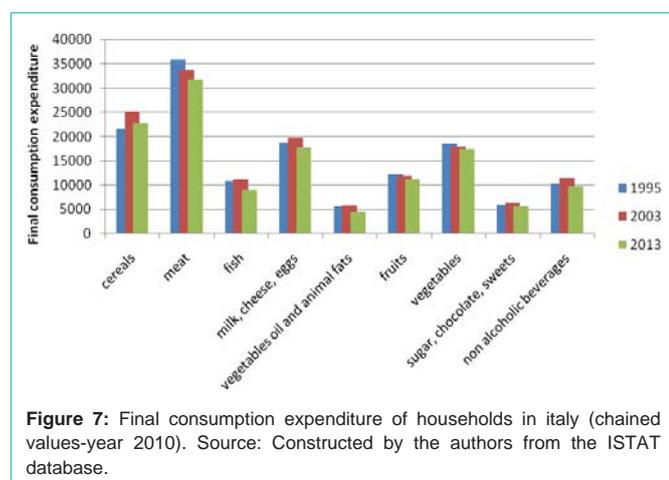


Figure 7: Final consumption expenditure of households in Italy (chained values-year 2010). Source: Constructed by the authors from the ISTAT database.

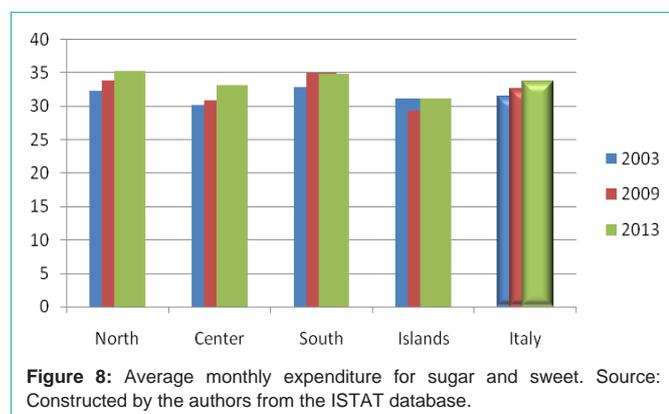


Figure 8: Average monthly expenditure for sugar and sweet. Source: Constructed by the authors from the ISTAT database.

Not only are these areas characterized by income well below the national average but also by a worse distribution of income and therefore, by greater inequality. This is shown in the *Gini* coefficient where values are much higher than the national average (Figure 6).

Spending on food consumption

Increased poverty has resulted in a reduction in expenditure on food, particularly meat and fish, with a slight reduction in spending on sweet and non-alcoholic beverages (Figure 7). In fact looking at three different years in the decade considered, the average monthly expenditure for sugar and sweets continues to grow in the country as a whole and also in each one of the areas (Figure 8).

Discussion

Health and wealth have always been closely related and the economically disadvantaged groups of population experience important consequences for their health.

Studies reveal that income differentials have widened over time and that increases in income inequality in Europe appear to be the driving force behind the widening health disparities [30-35]. Extensive literature documents, in fact, inverse associations between position in socioeconomic hierarchies (defined by household income, years of education, occupational grade) and mortality or rates of some diseases [36-43].

The literature shows that there is a relationship between health and income, and the poorest fractions of the population are the most

Table 3: Price Index and percentage change.

	2000	2013	% Change 2000/2013
Fresh fruit	107.4	111.1	3.45
Fresh vegetables	107.5	108.4	0.84
Sugar, chocolate, sweet	111.2	109.2	-1.80
Non-alcoholic beverages	106.0	101.2	-4.53

Source: Constructed by the authors from the ISTAT database

vulnerable. In particular, this social disadvantage over whelming affects the poor considering the incidence of chronic diseases and the access to treatment. Policies should favour the most disadvantaged sectors.

Regarding the above, numerous international studies show how chronic diseases, including diabetes, affect socially disadvantaged groups in particular. Even in Italy diabetes is one of those chronic diseases that continue to affect the most disadvantaged, where behaviours such as obesity, sedentary illness, poor nutrition and poor attention to health controls may favour the onset of diabetes or aggravate complications.

In 2013, in Italy, the mortality rate for diabetes was 3.4%. In the North this rate was 4.6% and in the Centre the 5.2%. In this regards, the higher mortality rate of diabetes in Italian people is recorded in the South, where the rate is 6.9 % and in the Islands (6.0%). In these areas GDP per capita is always lower than the national average, confirming that diabetes is more common in the most disadvantaged groups where risk factors, such as obesity are more frequent (Figure1).

Several lifestyle changes have given rise to a nutritional transition: reduced energy expenditure, sedentary behaviour, less physical effort in the workplace and at home, and the transformation of the food market offering manufactured products worldwide. Consequently, traditional diets based largely on vegetables, complex carbohydrates and fiber, have been replaced by diets high in energy content: added sugar, saturated fat and animal foods [19].

Changes in eating patterns are the product of modernity: industrialization, urbanization, economic development and the globalization of markets have accelerated over the past four decades. With urbanization, qualitative changes were generated in the production, processing, distribution and marketing of food. The food market now offers ultra-processed food, manufactured and marketed worldwide, and consequently has altered dietary habits and the ways of life, not always favourably. There have also been negative effects on food patterns, which have impacted on the health and nutritional status of populations [44-48].

This change in eating habits has resulted in increased diseases like obesity, diabetes mellitus, cardiovascular diseases, hypertension, particularly among the poor people since industrial products rich in fats and sugars also have lower and more stable prices over time, unlike fresh fruits and vegetables are subject to frequent price fluctuations (Figure 4) [20].

The consumption of fruits and vegetables is essential to ensure a diversified and nutritious diet. In high incomes populations' wider access to a greater variety of foods, such as Italy for example, the apparent consumption of fruit in the period of this study changed from 151 to more than 180 kcal/pers/day. Furthermore, there was

great diversity, as reflected in the “other” category that was almost 50% of the apparent consumption of fruits. However, when analyzed by region and in relation to relative prices, lower consumption is observed in the poorer regions than in the richest ones. Along with social and economic changes, this trend suggests that the frequent price variations of fruits and vegetables shaped the pattern of food consumption; by encouraging low income groups to consume products with lower and generally stable prices (e.g. fruit juices). In support of this suggestion it should be noted that the reduction in real GDP per capita since the 2009 crisis (Figure 5) has affected the whole of Italy but particularly the South and the Islands.

In this regards, structural social determinants should consider, which cover a wide and complex combination of socio-economic conditions, cultural and other environmental elements that interact. Diet has evolved over time due to the influence of different factors and multifaceted interactions. Income, prices, individual preference, belief, cultural traditions, as well as geographical, environmental, social and economic characteristics from the pattern of food consumption through complex interaction.

As the above clearly shows, the composition of dietary patterns have changed with an 8% increase in apparent consumption of foods of animal origin and vegetable oils and animal fats in 7% between 1961 and 2013.

Conclusion

The above shows that promoting diets and healthy ways of life to reduce the global burden of non-communicable diseases requires multi-sectorial management. The approach must involve the social determinants of health and the participation of various sectors of society, providing an appropriate framework. Following up from the UN Political Declaration, in November 2012, governments agreed on a Global Monitoring Framework for NCDs, including a set of 9 voluntary targets and 25 indicators for monitoring and surveillance. The first international goal for diabetes was “to stop the rise in diabetes and obesity.” According to data from IDF members, most European countries are progressing moderately in response to diabetes, although better results are expected if more vigorous measures are taken [49].

According to IDF’s Global Diabetes Scorecard, Italy’s health system is performing well and the monitoring and surveillance framework is regularly implemented. There is a national diabetes plan but it needs to be more widely applied and there is no plan to combat noncommunicable diseases. Policies and services to prevent diabetes must be strengthened. A large proportion of diabetes-related deaths (32.2%) have been avoided because of the relatively high level of investment in health expenditure. Policies for healthy food production are in place and fully implemented while policies on access to healthy food and marketing to children are partially realized. However no measures have been taken to limit salt, sugar or fat intake. Although already in place the Italian national diabetes plan needs to be fully and better implemented [49].

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