CHAPTER 7

Food, nutrition, and health in Croatia

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7.1 Introduction

All food products placed on the market must be safe for consumption (Knežević, Đugum, & Frece, 2013). High quality of a food product is also advisable, while a minimum quality is prescribed in regulations. It is also desirable that food does not cause human diseases, although this needs to be considered, having in mind the combination of food composition, recommended portion size, and daily consumption. For example, fats are macronutrients important for normal body functions; however, overconsumption of foods rich in animal fats contributes to elevated risk of chronic diseases such as cardiovascular disease.

Croatia is abundant in natural resources for food production (e.g., soil for various crops used as food and feed, pastures for cattle, water, etc.). Agriculture is, besides tourism, one of the most important sectors of economy. While commercial agriculture is not competitive enough, the organic food market is attracting more and more consumers because they perceive organic food as healthy.

Due to their long history of use, traditional and ethnic foods are also considered healthy (Prakash, 2015). The term *traditional foods* encompasses various foods consumed locally and regionally for an extended period. Recipes including ingredients and preparation procedures are passed from one generation to the next. Although there are many definitions of the traditional foods, the one developed by the European Food Information Resource (EuroFIR) is the most appropriate.

> *"Traditional" means conforming to established practice or specifications prior to the Second World War. Traditional food is a food with a specific feature or features, which distinguish it clearly from other similar products of the same category in terms of the use of "traditional ingredients" (raw materials of primary products), "traditional composition," or "traditional type of production and/or processing method" (Weichselbaum, Benelam, & Soares Costa, 2009, p. 5).*

This definition was also acknowledged by the Food and Agriculture Organization (FAO) (Weichselbaum et al., 2009). Traditional foods originate from the tradition and the culture of a population and thus fall within the consensus definition of *sustainable*

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diets that was developed within the International Scientific Symposium "Biodiversity and Sustainable Diets" held in Rome in 2010 (FAO, 2011).

Sustainable Diets are those diets with low environmental impacts that contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair, and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources (FAO, 2011, p. 10).

Therefore, traditional foods have added value in the world where there is a growing interest for sustainability in all aspects of life. Daily food consumption brings the food production and food market high on the list of priorities. Countries, including Croatia, aim to produce enough food to satisfy the needs of most of its population (Renko & Bošnjak, 2009). Conventional agriculture aims to produce large amount of food to satisfy the need for food availability (Renko & Bošnjak, 2009), but consumers are more often interested in sustainable food production.

The culture of eating plays a crucial role in the life of a person, community, and country as a whole. In spite of trends in nutrition that lead to typical Western diet and rising presence of processed and ready-to-eat foods, traditional Croatian dishes are treasured and used even today (Miholek, 2019). Although some traditional foods are a part of the daily diet, in general, at the household level, they are consumed especially at special occasions like childbirth, weddings, funerals, Lent, Christmas, or Easter. The public offer (restaurants, pubs, etc.) that combines agriculture, nutrition, and gastronomy with tourism revives traditional foods and presents them to new potential consumers and, therefore, is a promise that traditional dishes will retain their longevity.

7.2 Historical overview

Overall diet and food habits are part of a nation's culture and these are especially important in traditional societies and relatively small rural communities (Randić, 2001). Food culture is dynamic, not static. Changes in food choices, preparation procedures, and eating habits depend upon a person, but they also occur under the influence of the community and society as a whole.

Due to socioeconomic and cultural differences and food availability, few eating patterns are observed in Croatia. First available data of food culture in Podravina region dates back to 1896 when archaeologist Rudolf Horvat described the foods commonly served for various special occasions round the year. The central place in diet belonged to milk, dairy products, and pasta. Breakfast included cereals, pasta or soup, lunch included soup, vegetable porridges, and occasionally beans with some Sunday meat leftovers. Friday and other fasting days encompassed various kinds of pasta and bakery products with cheese, pumpkin, and poppy seed stuffing. For dinner, lunch leftovers or milk-based dishes were served. Sunday menu differed and included

soup, meat, potatoes, salad, and cake. Fats included pork fat and pumpkin-seed oil (Mesarić & Matijaško, 2013).

The most consumed food on the Adriatic islands was maize meal/polenta (Jakšić, 2014). Other cereals were mainly purchased or traded for other foods since the islands soil was not highly cultivable. Barley seeds were used to prepare a coffee-like drink. Today one of the most common cereals on the islands is rice. Vegetables were various and included those cultivated and those gathered from nature (e.g., chicory, asparagus, fennel, dandelion). They were prepared in various combinations, depending on their availability, by boiling. Fruits were consumed fresh. Cooking and seasoning was done with olive oil. Fishermen and peasants ate fried small fish (e.g., pilchard, anchovy, smelt), while bigger fish was sold. Some fish was salted and dried. Oysters were eaten fresh, while mussels and crabs were cooked. Fasting menu included cod. Sheep were raised for milk and wool, and goats for milk, but their meat was not often consumed. Chickens were raised for eggs, while their meat was given only to sick people or prepared for the Easter lunch. Wild animals (e.g., birds, rabbits, dormouse, snails, etc.) and mushrooms were also consumed. A typical day was beginning with coffee with milk and a piece of bread for women and children, while men drank a little brandy and ate few figs and some cheese or bread with salty fish. Small meal followed before lunch, then the lunch, and after dark the dinner. Sunday menu included meat soup, boiled or roasted meat or fish, pasta or potatoes, some salad, cake, and wine (Jakšić, 2014; Randić, 2001).

Today, the open market and food trade influence Croatian dietary habits leading to the unification and domination of the Western diet patterns across all regions in the country.

7.3 Geography and the natural agricultural landscape

From the geographical and agricultural perspective, Croatia is divided into three regions: continental, mountainous, and Adriatic (Husnjak, Mesarić, & Mesić, 2014). The lowland continental area is part of the Pannonian Plain, the Adriatic coastal belt is part of the Mediterranean, while the highland-mountain area belongs to the Dinaric Alps (Klemenčić, 1993). The Adriatic region is partly characterized by soils with a thermic temperature regime (i.e., mean annual soil temperatures of 15°C or more, but lower than 22°C, and a variability in the summer-winter soil mean temperatures greater than 5°C at 50 cm below surface). The other part of the Adriatic region, similar to the rest of Croatia, has soils with a mesic temperature regime (i.e., annual soil temperatures of 8°C or more, but less than 15°C, and a variability in the summer-winter soil mean temperatures greater than 5°C at 50 cm below surface) (Husnjak et al., 2014). Within the Mediterranean region, the Adriatic islands represent a specific place regarding lifestyle and dietary habits. Due to the geography, natural, and climatic

conditions in combination with the tradition and culture of the population, Croatia has many autochthonous agricultural food products (Gaćina, 2017).

Considering the geography and its impact on food and diet, Croatian islands come into focus. Here, in somewhat isolated surroundings, the local population relied on available natural sources (Jakšić, 2014). Sheep and goat milk were among those sources (Jakšić, 2014). Goat milk was used as a fresh drink for children and adults, as well as in food preparation. Sheep milk was used for the production of cheese (Randić, 2001). Today, hard cheeses produced from sheep milk by the inhabitants of Pag, Brač, and Krk islands are considered one of the most treasured traditional foods in Croatia (Blažić, Pavić, Zavadlav, & Marčac, 2017). In order to present them to a wider public and to encourage their consumption as part of the modern diet, some of these cheeses were awarded by the Croatian Chamber of Economy with an Authentic Croatian label (Blažić et al., 2017).

7.4 Culture, traditions and traditional Croatian foods

The versatility in preparing food and eating habits is determined by the geographical location, as well as by the availability of food and of other resources. Some food traditions are present throughout the country, while others are typical for small geographical areas. For example, Lent on Good Friday is one of the common traditions around the country, cake *hrapoćuša* from the Island of Brač is served for Christmas, Easter, or at weddings, *fritule* are fried in winter and obligatorily for Christmas Eve, New Year's Eve, and Shrove Tuesday (Randić, 2001).

An abundance of natural resources contribute to the variety of traditional Croatian food products. Due to their quality and specific organoleptic characteristics, many of them are not only part of the Croatian gastronomic offer, but are present in the daily diet, too. In order to enhance their identity and present them to the wider public, these traditional food products are protected. To date, 24 Croatian food products are registered in the Database of Origin and Registration (DOOR) (Table 7.1). Of these, 13 food products are registered for Protected Designation of Origin (PDO) and 11 food products have Protected Geographical Indication (PGI) status.

Below, a selection of traditional Croatian foods is presented along with the ingredients, method of preparation, and tradition of their consumption. It should be noted that despite consumers' general perception of traditional foods as being healthy, it does not necessarily mean that these provide particular health benefits (Weichselbaum et al., 2009).

7.4.1 Traditional cheeses

Milk and dairy products belong to the category of staple foods (Fathima, Nallamuthu, & Khanum, 2017). Traditional cheeses are produced according to recipes passed down

Table 7.1 Croatian food products registered in the Database of Origin and Registration (DOOR).

Food product	Brief description	Designation
Paški sir	Cheese produced on the Adriatic island of Pag exclusively from autochthonous sheep milk	PDO
Paška sol	Sea salt produced on the Adriatic island of Pag	PDO
Istra	Extra-virgin olive oil	PDO
Slavonski med	Honey produced in the eastern part of Croatia called Slavonia	PDO
Varaždinsko zelje	Cabbage variety (*Brassica oleracea* var. *capitate f. alba*) autochthonous for Varaždin region (Bogović, Vincek, & Ozimec, 2011)	PDO
Šoltansko maslinovo ulje	Extra-virgin olive oil produced on the Adriatic island of Šolta	PDO
Paška janjetina	Lamb produced on the Adriatic island of Pag	PDO
Korčulansko maslinovo ulje	Extra-virgin olive oil produced on the Adriatic island of Korčula	PDO
Krčko maslinovo ulje	Extra-virgin olive oil produced on the Adriatic island of Krk	PDO
Istarski pršut	Dry ham	PDO
Ogulinsko kiselo zelje	Sour cabbage from Ogulin	PDO
Ekstra djevičansko maslinovo ulje Cres	Extra-virgin olive oil produced on the Adriatic island of Cres	PDO
Neretvanska Mandarina	Mandarins (tangerine) produced in the Neretva valley	PDO
Zagorski mlinci	Traditional pasta from Zagorje	PGI
Lička janjetina	Lamb from the region of Lika	PGI
Međimursko meso 'z tiblice	Traditional meat product from Međimurje; Meat from "tiblica" is preserved in cold, minced, pretreated fat tissue	PGI
Slavonski kulen/Slavonski kulin	Traditional dry sausage produced in Eastern Croatia in the region of Slavonia	PGI
Zagorski puran	Turkey from Zagorje	PGI
Poljički soparnik/Poljički zeljanik/Poljički uljenjak	Traditional bakery product	PGI
Dalmatinski pršut	Dry-cured ham from Dalmatia	PGI
Drniški pršut	Dry-cured ham from Drniš	PGI
Lički krumpir	Potato from Lika	PGI
Baranjski kulen	Traditional dry sausage produced in Eastern Croatia in the region of Baranja	PGI
Krčki pršut	Dry ham from the Adriatic island of Krk	PGI

PDO, Protected Designation of Origin; *PGI*, Protected Geographical Indication.

from generation to generation. They preserve the tradition and culture of a certain area and at the same time represent a source of income for cheese producers and their farms (Blažić et al., 2017).

The nutritional value of cheese depends on the milk used for its production, as well as the production procedure, and storage conditions. All types of cheese are a rich source of

protein, calcium, phosphorus, and magnesium. The carbohydrate and fat content vary with the production method and maturity level (Blažić et al., 2017). Due to the fermentation processes that occur during cheese production, lactose content in cheese is much lower than in milk and as a result, cheese is acceptable to lactose intolerant persons (Tudor, 2008).

Beside their positive nutritional aspects it is important to note that most cheeses have high salt content (Tudor, 2008).

A traditional Croatian cheese is *Paški sir*. It belongs to the group of hard cheeses with high fat content (33.33 g/100 g—product nutrition declaration). It is used for seasoning of pasta and other meals together with parmesan. It is obtained from fresh sheep's milk and its production is seasonal due to milking season (January until June) (Gligora & Antunac, 2007). Until the First World War cheese was manufactured with the addition of homemade rennet obtained by extracting the enzyme from lamb. Since the period between the two world wars, this cheese is predominantly produced with the addition of commercial rennet (Baković, 1961). The choice of rennet, homemade or commercial, does not influence significantly the cheese parameters in terms of quality, yield, or its sensory characteristics (Oštarić, Antunac, Prpić, & Mikulec, 2015). Production starts with the addition of rennet to the milk. It takes about an hour for milk to coagulate. Than the curd is cut by hand and the cheese is shaped. Salting is done in two parts: the first time 4–5 h after shaping and second time after 24 h. Ripening is conducted for at least one month and during this period the cheese needs to be turned regularly and from time to time washed with seawater (Baković, 1961). In line with the European Union (EU) and the Croatian legislation, all registered producers of *Paški sir* must implement a Hazard Analysis Critical Control Points (HACCP) system to assure safety of their products (Gligora & Antunac, 2007).

Turoš is another traditional cheese, although not so common as *Paški sir*. This semihard, dried, acid, salted, cone-shaped cheese that contains milled dry red paprika is originating from the Međimurje region (north western part of Croatia). It contains on average 14.50 g/100 g of fat, 27.23 g/100 g of proteins, 4.45 g/100 g of salt, and 56.46 g/100 g of total solids. It is produced from fresh cow's milk without the addition of starter cultures. Milk is poured into glass jars and left in a warm place until it sours. After that, the cream is skimmed off the surface, the whey is partly removed and the resulted soured milk is heated for about 3 h (until the curd rises to the surface). The formed curd is poured into cheesecloth and left one day for drying (Valkaj, Cerjak, Kalit, Rako, & Wendorff, 2013). Salt (40 g), sweet red paprika (20 g), and hot red paprika (2 g) are added to the fresh cheese (1845 g) and then it is shaped by hands into small cones (average cone weight 165 g, average cone height 8.6 cm, average cone diameter 6.8 cm) (Valkaj, Kalit, Salajpal, Zubović, & Marković, 2014). Shaped cheese is left to dry for seven days above the stove or in the sun (Valkaj et al., 2013).

7.4.2 Traditional meat products

The technology for producing traditional meat products in households, family farms, and small-scale manufacturing companies has a long tradition in Croatia. Household production of traditional meat products uses only table salt, herbs, and spices, which are combined with smoking, drying, and fermentation. On the list of these products are found *kulen*, sausages, bacon, smoked meat, etc. (Pleadin et al., 2015). Most of the traditional Croatian dry sausages are fermented sausages and the most representative among them is the *Slavonian kulen*.

Slavonian kulen is a traditional cold-smoked fermented dry sausage originating from Eastern Croatia (Mesić, Cerjak, & Tojčić, 2011). It is prepared by mixing minced pork (ham, back fat, and some shoulder, without collagen) with table salt, red paprika (sweet and hot), and garlic, which are then stuffed into a pig's blind gut (Kovačević, Mastanjević, Šubarić, Jerković, & Marjanović, 2010). *Slavonian kulen* is similar to the long matured fermented sausages from Southern Europe, with the addition of smoking (Karolyi, 2011).

Another similar product is the traditional *Baranjski kulen*, which is produced following the traditional artisanal recipe. Beside the meat of high quality, this product contains sweet ground red paprika, hot ground red paprika, white ground pepper, garlic powder, table salt, and sucrose. Fat content ranges from 8.60% in the industrial products up to 9.27% in traditional ones. Due to its popularity, this delicacy is today produced at industrial scale (Marušić Radovčić et al., 2014). Both *Slavonski kulen* and *Baranjski kulen* are listed on the DOOR as PGI food products.

Dry-cured meat products, especially dry-cured ham, are typical products of the Mediterranean countries like Italy (e.g., *Prosciutto di Parma, Prosciutto di Modena)*, Spain (e.g., *Iberian Guijuelo, Serrano dry-cured ham*), and France (e.g., *Jambon de Bayonne*). Because of differences in pig breeding and ham processing, dry-cured ham from each of these countries have some specific properties (Krvavica & Đugum, 2006; Tomić et al., 2016). The same is true for dry-cured hams produced traditionally in the Croatian coastal area (Table 7.2). Few dry-cured ham types are registered at the EU level as PDO (i.e., *Istarski pršut*) or PGI (i.e., *Dalmatinski pršut*, *Drniški pršut*, *Krčki pršut*).

Istarski pršut (Istrian Prosciutto) is a particular meat product because it is produced without skin and subcutaneous fat. As a result, water loss is faster and final water content is below 55%. For the production of other similar products like *Dalmatinski pršut* (Dalmatian Prosciutto) and *Drniški pršut* (Drniš Prosciutto), a water content of 40%–50% and up to 40% is required, respectively. From a macronutrient point of view, it is interesting to note that prosciutto has high protein content (33.78% in Istrian Prosciutto, 31.78% in Dalmatian Prosciutto, and 29.13% in Drniš Prosciutto) in comparison with fresh meat. Its fat content (16.01% in Istrian Prosciutto, 14.85% in Dalmatian Prosciutto, and 16.76% in Drniš Prosciutto) and fat composition (PUFA/SFA: 0.18 in Istrian Prosciutto, 0.27 in

Table 7.2 Production specifics and selected sensory properties of Croatian Prosciutto (Gaćina, 2017).

	Istarski pršut (Istrian Prosciutto)	Dalmatinski pršut (Dalmatian Prosciutto)	Drniški pršut (Drniš Prosciutto)	Krčki pršut (Krčki Prosciutto)
Skin and subcutaneous fat	No	Yes	Yes	Yes
Flavorings	Sea salt, pepper, garlic, laurel, rosemary	Sea salt	Salt	Salt, pepper, laurel, rosemary
Curing	No	Yes	Yes	No
Drying and ripening	12–18 months	Min. 12 months	12–18 months	Min. 12 months
Surface molds	Yes	–	Yes	–
Aroma	Specific	Specific (smoke)	–	Dry pigs meat
Saltines	Medium	–	Low	–
Color	Pink–red	–	Ruby red	–
Artificial additives	No	No	–	–

Dalmatian Prosciutto, and 0.19 in Drniš Prosciutto) vary with breed and breeding method (Tomić et al., 2016).

The manufacturing process of traditional meat products uses high salt content that can increase blood pressure leading to hypertension, which further elevates the risk of heart, brain, and kidney diseases (Pleadin et al., 2015). Pleadin et al. (2015) analyzed 124 traditional meat products for their content in salt and found that the dry and semidry-cured meat products (i.e., prosciutto, dry ham, dry rack, dry shoulder, smoked sirloin, smoked rack) had the highest salt content, followed by bacons, while sausages (i.e., homemade sausage, *kulen*) had the lowest salt content. The average values varied between 4% and 8% indicating that traditional meat products should be consumed moderately. Furthermore, the presence of polycyclic aromatic hydrocarbons (PAH) formed during smoking of traditional meat products should also be considered as one of the risks due to their carcinogenic effects in humans (Karolyi, 2011). Benzo(a)pyrene (BaP) (0.05–0.10 μg/kg) and PAH4 (i.e., benzo[a]anthracene, chrysene, benzo[b]fluoranthene, and benzo[a]pyrene) (0.41–0.67 μg/kg) content found in Croatian dry-cured ham samples did not exceed the current legal levels according the European legislation. PAHs were found even in *Krčki pršut* and *Istarski pršut*, which are not cured—most probably as a result of spice addition in the salting phase (Poljanec et al., 2019).

The inhabitants of the Mediterranean part of Croatia, especially the Adriatic island, due to the above mentioned geographical isolation and necessity to use what is available, have developed their own food products. One of them is *vitalac*, a traditional meat dish characteristic exclusively for the Brač island and therefore often called *Brački vitalac* (the *vitalac* of island of Brač). *Vitalac* is a dish prepared of young suckling lambs' or young goats' offal (e.g., heart, lungs, liver, spleen, abdominal membrane, and intestines). Offal is chopped into pieces and spiked randomly on a spike that was made in the past out of wood, usually juniper, while nowadays it is usually a metallic one.

After the prepared pieces of offal are skewered, they are wrapped up in abdominal membrane and at the end in small intestine of the animal. The prepared skewer is roasted over live coals for about one hour. Until present, *vitalac* has remained part of the local gastronomic offer and part of every family festive meal. Nowadays, unlike before, when it was the only meal for the poor, *vitalac* is usually served as a first dish (Jakšić, 2014). In 2007 *vitalac* was registered and protected as an intangible cultural heritage by the Croatian Ministry of Culture.

7.4.3 Bread and bakery products

Poljički soparnik is a traditional bakery product made of wheat flour, chard, red onion, olive oil, garlic, salt, and water. *Soparnik* is circular in shape, 90 up to 110 cm in diameter. After baking in open hearth, olive oil and fresh garlic are spread on top. The prepared *soparnik* is cut into rhombus-shaped pieces for consumption (Šarolić et al., 2019). *Soparnik* is prepared for Christmas Eve, during the Lent period, Good Friday, for the agricultural work in the field, and for the local church saint's day celebrations (Šimunović-Petrić, 1992).

Pogača z oreji is a traditional bakery product, which is prepared in Đurđevac and its surroundings since the end of the 18th to the beginning of the 19th century. It is prepared from unleavened dough and cracked walnuts. Beside wheat flour and walnuts, which are the basic foodstuffs, fat, sugar, salt, and water are also needed to prepare it, although these are used sparingly. After the preparation, *pogača* is baked in a traditional oven made of clay. *Pogača z oreji* is characterized by its tenacious dough and crispy crust. Like *soparnik*, this *pogača* used to be a meal for the poor people and was consumed only on special occasions like sowing, harvesting, grape picking, and other agricultural activities that included many people. *Pogača z oreji* has a special place at childbirth celebration when every godmother brings this traditional food among other gifts to her godchild (Miholek, 2019). In 2017 this product was registered and protected as an intangible cultural heritage by the Croatian Ministry of Culture.

7.4.4 Cookies, cakes, and other desserts

Traditional cakes were, unlike the modern ones, prepared usually from only few ingredients with small addition of sugar. Although many of them are still present in the gastronomic offer today, for the purpose of this overview, only a few selected ones are presented.

Paprenjaci (pepper cookies) are cakes prepared from flour, sugar, honey, oil, and spices. The dough is kneaded, rolled, and cut into pieces (Randić, 2001). *Paprenjaci* from Hvar, Brač, and Korčula are considered specialties (Randić, 2001).

Kroštule are fritters made of wheat flour, sugar, eggs, oil, and brandy. The medium–hard dough prepared is shaped by rolling and cutting it into thin ribbons, and sometimes twisted in various knots before frying. At the end of frying, *kroštule* is sprinkled with sugar (Randić, 2001).

Hrapoćuša: Among the traditional Dalmatian desserts like *fritule* (carnival donuts), *krošťule*, and many other similar products available across the Mediterranean region, a special place belongs to *hrapoćuša*. *Hrapoćuša* is a traditional cake from the island of Brač, specifically from the village Dol. Main compounds used to prepare *hrapoćuša* are domestic local eggs and walnuts, and its rustic and scabrous appearance reminds of the local rocks (Jakšić, 2014).

7.4.5 Fats and oils

Fats and oils represented an important source of energy. While the traditional continental diet was characterized by the consumption of animal (most commonly pig's) fat, the Croatian coast and islands used olive oil as predominant fat. Benefits of olive oil consumption are well-known and documented (Šarolić, Gugić, Marijanović, & Šuste, 2014). Unlike olive oil, which is modern, popular, and considered healthy, high animal fat consumption is associated with elevated risk of many chronic noncommunicable diseases with special emphasis on obesity and cardiovascular diseases. However, some of the traditional products predominant in animal fats have retained their place in the current Croatian diet, such as cracklings.

7.5 Sustainability and environment (preservation options)

Sustainable diets solve the problems of food waste and environmental pollution caused by food production and the distribution chain. At the same time, they promote the consumption of traditional, seasonal, locally produced foods (FAO, 2011).

Some of the Croatian traditional food products like *Paški cheese* and *Slavonian Kulen* are highly present in the daily diet. Although traditionally produced homemade products have the highest prices on the market and are the most respected among consumers, they are also produced on an industrial scale to meet market needs. On the other hand, traditional products like *Poljički soparnik* are protected. Through the protection procedure, traditional foods are presented to the wider public to remind of the old rural times and keep traditional customs alive. Although they used to be food for the poor, today traditional foods represent a brand and they are offered on all cultural and gastronomic events around Croatia (Šarolić et al., 2019).

Since tourism represents an important part of the Croatian economy and many tourists seek food specialties when visiting places, traditional foods should be promoted within the tourism offer.

7.6 Present nutritional conditions

Various authors continuously conduct studies providing insight into the dietary habits of specific population groups. The results show that dietary habits of the population in Croatia, due to variations in food supply and tradition, vary from region to region.

On the other hand, the unification of diets under the influence of the globalization process is increasing daily.

Schoolchildren and adolescents from Zagreb and Pazin are reported to have very high protein intake (235.9% and 139.6% RDA, respectively) (Colić Barić & Šatalić, 2002; Colić Barić, Cvjetić, & Šatalić, 2001). Adolescents from the eastern continental part of Croatia skip meals, especially breakfast, boys have high meat and meat products consumption, and girls have high fruit and vegetable consumption. Girls (34.7%) also practice dieting, but at the same time have high consumption of sweets (50% takes sweets 1−2/day and additional 26.4% of girls take sweets 3 or more times daily) (Milosavljević, Mandić, & Banjari, 2015).

Student population is often included in studies. This is because students are available to take part in the studies and, on the other hand, because young people early in their lives are prone to changing dietary habits and therefore represent a good choice for dietary interventions if intakes are not in line with the dietary guidelines. The study conducted in Croatia on student population by Šatalić, Colić Barić, and Keser (2007) reported that students are skipping breakfast, have higher energy intake than recommended (130%) and double protein intake than recommended. Many micronutrients were consumed below the recommendations. Girls were trying to lose weight by dieting (Banjari, Kenjerić, Mandić, & Nedeljko, 2011). The study conducted by Pavičić Žeželj, Dragaš Zubalj, Fantina, Krešić, and Kenđel Jovanović (2019) on student population of University of Rijeka reported medium to low adherence to the Mediterranean diet, which is associated with reduced risk of many noncommunicable diseases. The authors highlighted the importance of health promotion programs and diet education.

In the eastern, continental part of Croatia, the diet of adults is characterized by high intake of animal foodstuffs, especially meat and meat products. This is resulting in fat intake higher than recommended (33.4% of total daily energy intake) with elevated intake of saturated fatty acids (9.9% of total daily energy intake), and high n-6 to n-3 fatty acid ratio (Primorac et al., 2003). Total dietary fiber intake in urban adults was estimated to 30.0 g/day (Perl et al., 2003), which is in line with recommendations. Micronutrient intake was analyzed in several studies. Calcium intake, food sources, and seasonal variation in diet of adults in Eastern Croatia were investigated by Mandić-Puljek, Mandić, Perl, and Kenjerić (2005). Results have shown calcium mean intake of 965 mg/day for the studied population with an average of 909 mg/day for women and 1105 mg/day for men, with milk and dairy products as the main dietary sources. A satisfying intake was also noted for potassium, magnesium, phosphorus, and copper (Mandić, Kenjerić, & Perl Pirički, 2009). Another study reported lower calcium intake (661 mg/day) and confirmed higher intakes in men (805 mg/day) than in women (599 mg/day) (Mandić-Puljek, Kenjerić, Mandić, Perl Pirički, & Kaić-Rak, 2014). The same study reported compromised bone health status within the study population, which could be caused by a low calcium intake

(Mandić-Puljek et al., 2014). High intake of sodium was found in both males and females (Mandić et al., 2009). Iron deficiency is one of the most frequent nutrient deficiencies. Low iron intake was reported for adult nonpregnant women from Eastern Croatia (Mandić et al., 2009), as well as for the pregnant ones (Banjari, Kenjerić, & Mandić, 2013), and plant-based foods were its dominant source. Intakes of vitamins were satisfactory with the exception of niacin intake in women (Mandić, Primorac, Kenjerić, Mandić-Puljek, & Perl Pirički, 2008).

Other studies conducted in the northern coast of Croatia focused on pregnancy and lactation as the period convenient for early dietary interventions for the future. These have reported a lower energy intake than recommended (Dujmović, Krešić, Mandić, Kenjerić, & Cvijanović, 2014; Krešić, Dujmović, Mandić, & Redžić, 2012), as well as a lower intake for minerals like magnesium and zinc, and vitamins like A, B1, B6, D, and folate (Krešić et al., 2012). A study on 9070 adults from across the country identified the highest prevalence of unhealthy dietary habits in Eastern and Central Croatia, which was reported in men compared to women. The city of Zagreb and the coastal region were reported to have the lowest prevalence of unhealthy dietary habits (Doko Jelinić et al., 2009). Continental population was also reported to have higher burden of cardiovascular risk factors (Bergman Marković et al., 2011). Based on the obtained differences the authors concluded that dietary recommendations should be region specific to achieve higher impact (Doko Jelinić et al., 2009).

Results of a study on dietary habits of population on the Croatian Adriatic island presented by Missoni (2012) indicated a general shift in dietary habits under the influence of globalization. The intake of meat and meat products, as well as of other animal products rich in fat, has increased, while at the same time the level of physical activity decreased, which led to a higher risk of chronic noncommunicable diseases. A cross-sectional study conducted on adults from the Adriatic island of Hvar also reported a shift in the dietary patterns from a traditional Mediterranean diet toward dietary patterns associated with metabolic syndrome (Sahay et al., 2013). Another cross-sectional study conducted on 10,001 adults from the Adriatic islands Korčula and Vis, and the city of Split revealed rather poor adherence to the Mediterranean diet patterns. Overall, only 23% of the participants were adherent, and the adherence was lowest among younger participants (Kolčić et al., 2016).

Other studies, on elderly, have shown an adequate nutrition in most of this population group (Kovačević & Prlić, 2011).

When considering above mentioned data, it should also be noted that these were obtained by various dietetic methods (e.g., duplicate diet, food records, food frequency questionnaire, 24-h recall method) and study types (e.g., cross-sectional, cohort), as well as by a various study design overall.

Food consumption at the country level was for the first time systematically analyzed in the National Food Consumption Survey conducted by the Croatian Food

Agency (www.hapih.hr/about-us/) in 2011–12. The study included a representative sample of adults (between the ages of 18–64 years) and data collection was performed on two separate occasions to gain a better understanding of seasonal variation. The data obtained from the detailed analysis of the subsets based on geography confirmed the variability in food and drink consumption between the regions of Croatia (Hengl, Jurković, & Sokolić, 2018; Jurković, Sokolić, & Kenjerić, 2015; Jurković, Sokolić, Kenjerić, & Habuda-Stanić, 2017). There is also a confirmed variability with gender and age. The Croatian population is one of the largest consumers of pork in the EU, just behind the Hungarians. In terms of gender, the consumption of this category of food belongs largely to men, but there is a traditional pork product that is consumed in the same quantity at the gender level—it is smoked bacon. In terms of age, there is a tendency to consume smoked pork products as we age. Furthermore, the Croatian population consumes fish less than the EU. Data at national level are available via EFSA Comprehensive European Food Consumption Database (www.efsa.europa.eu/en/food-consumption/comprehensive-database). Various activities are being undertaken to increase fish consumption in Croatia. Regarding the preference for pork consumption, there are a lot of activities to promote the production and consumption of domestic breeds, such as black Slavonian pig, because of the higher content of unsaturated fatty acids compared to other breeds.

As dietary habits are changing in time, it is important to collect data regularly. Therefore, the scientific and professional community (e.g., universities, public health institutes, national agencies for agriculture and nutrition) led by the Center for Food Safety of the Croatian Agency for Agriculture and Food are conducting two new national surveys. These surveys are part of the EU Menu project, funded by EFSA, with the purpose of collecting data on dietary habits of all population subgroups (i.e., infants, small children, schoolchildren, adolescents, adults, and the elderly). The collected data will provide an update of exiting data and enable future actions where indicated, as needed.

Dietary patterns are also associated with foodborne diseases. Salmonellosis and trichinellosis are among the most common zoonoses in Croatia. Salmonellosis (caused by egg, egg-based products, or poultry consumption) is the most common in Zagreb population, while trichinellosis (caused by fresh pork meat consumption) has highest incidence in eastern continental part of the country (Dželalija, Medić, Pem Novosel, & Sablić, 2015).

7.7 Open questions

Due to their production and chemical composition, traditional foods have many benefits, but they also carry some risks (e.g., elevated salt intake, PAH exposure, zoonosis). It remains an open question how to balance these two sides and in which case risks

outnumber the benefits. For example, there is no doubt that meat and meat products are good source of proteins, but at the same time they are often a significant source of salt, which increases the risks of many chronic noncommunicable diseases.

7.8 Future outlook

The current food market provides all types of food round the year. The world has literally become one big village where everyone can eat various kinds of food. As a result, malnutrition is not represented in the Croatian population, with the exception of people who have an underlying medical condition or choose to avoid certain types of food, without knowing enough how to replace the nutrients for which the food is the main dietary source.

In such circumstances, the role of traditional foods is not only to fulfill the basic energy and nutrient need, but it becomes much more. It becomes a piece of memory reminding us of the past times and places. This idea can be implemented in the concept of "memory tourism" (Kocković Zaborski, 2017), enabling this way the sustainability of traditional products and their presentation to the wider public.

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