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ORAL HEALTH SYSTEMS IN EUROPE

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Oral Health Systems in Europe
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Dental care is an important topic for global health improvement and seems to represent a significant burden on total health costs. Global health financing is a big topic in the present days. The objective of this study is to overview the dental care systems in 8 selected countries in Europe: Switzerland, Germany, France, Italy, Netherlands, Spain, United Kingdom and Sweden in order to have a better understanding of the services provided to the European population.

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1. Introduction

1.1. Oral diseases burden worldwide

Dental care is an important field in the health of the world’s population. It is as well something often neglected by the governments when it comes to public health systems and the researches on dental diseases epidemiology are not yet optimal in order to produce precise data to compare countries.

Public oral health systems need the knowledge not only of the clinic sign of the oral diseases but all social, economic, cultural and environment factors, which are playing an important role on the development of oral affections.\textsuperscript{1}

Oral pathologies are a public health issue, as they are present in a major part of the population and implicate important treatment costs. The financial burden of dental treatments represents in average 20\% of the total ambulatory costs in France\textsuperscript{1} and from 5 to 10\% of the total public health expenditure in many high income countries.\textsuperscript{2}

Oral health in Europe improved significantly during the past 20 years, especially because of the fluoridation systems and other prevention programs. Nevertheless, disparities can be observed and the oral diseases still represent a common affection either in childhood and adults.\textsuperscript{2}

The two most important and common oral diseases are the dental cavity and the periodontal disease. 60-90\% of school children worldwide have dental cavities, resulting sometimes in premature tooth loss. The periodontal disease is present in 80-90\% of the adult population. 5-20\% middle-aged adults have a severe stage of the periodontal disease which leads commonly to tooth loss.\textsuperscript{2}

Periodontal disease has been largely related in the literature with other systemic conditions like cardio-vascular, chronic breathing diseases, osteoporosis and preterm deliveries. Risk factors for gum diseases are the same as for other health conditions, including tobacco and alcohol excessive consumption, diabetes, and immunodeficiency. \textsuperscript{3,4,5}

1.2 Concerned oral diseases

Dental cavity and periodontal disease are the two most common affections of oral tissues. They are closely related to social economic factors which influence on the access to professional care and information through prevention programs. \textsuperscript{1}

They are both multifactorial affections having always 4 groups of risk factors: \textsuperscript{6}

1) Etiology – bacterial plaque releasing acids and endotoxins resulting from its metabolism induces the demineralization of dental structures and inflammation of soft (gum) tissues.
2) Host – immune host’s system, peripheral blood circulation, tampon effect of saliva and resistance of tooth structures play a significant role on blocking the action of bacterial metabolic components.
3) Diet – sugars and carbohydrates cumulated on dental surfaces create a favorable environment for bacteria colonization and are good substrates for bacterial metabolism.
4) Time – the longer the bacterial plaque stays on the dental surface, the bigger is its potential to create damages. Time factor is blocked by a regular oral hygiene.

Dental cavities and periodontal disease are reversible conditions in a first stage. The advanced stages create irreversible damages for the oral structures. These damages require secondary and tertiary prevention actions.\textsuperscript{6}
1.3 Healthcare Provision

There are two different basic oral health systems in Europe. The covered oral services differ largely from one country to another and will be analyzed separately in this study.\textsuperscript{7}

1. National Health Service type
Public in nature
Financed by taxes and patient co-payments
Fully private (liberal) provision for remaining care

- **Categorical**
The scheme may be limited to certain people, for example, children, the elderly, low-income families

- **Universal**
Available to all citizens, but the treatment choices may be limited and/or access, in some geographical areas, restricted due to low fees.

2. Social Insurance type (“Sick Funds”)
Compulsory public health insurance, maybe supplemented with voluntary supplementary insurance
Contributions to the insurance usually related to income
Patients make co-payments for claim reimbursements from the sick funds
Fully private (liberal) provision for remaining care (prices may be regulated)

- **Income ceiling**
There are income criteria for excluding some adults from access to all or most of care within the schemes. So, there is mainly private provision and finance, with a government organized residual health service for specific “priority” groups.

- **No Income ceiling**
There may be other criteria for access – but usually full access for the elderly and children, other medically compromised and low income adult groups.
Partial access (i.e. limited care) for adults above a low level of earnings \textsuperscript{7}

Dental care is an important topic for global health improvement and seems to represent a significant burden on total health costs. Global health financing is a big topic in the present days, as health care costs keep growing in an important way. In Switzerland the health costs increase more than the GDP.\textsuperscript{36} Therefore hospital, ambulatory, pharmaceutical and other health costs are meant to be controlled and managed. The oral care being part of this burden must be reconsidered regarding the following aspects:

- Most common oral affections are susceptible to be prevented by simple and affordable measures.
- New technologies for dental reconstruction and replacement have been fast diffused worldwide. These modern therapeutics are more expensive than the traditional ones and will need time to prove their evidence based long term cost-efficacy.
- Poor quality control is observed in the dental field. Dentists are not often checked regarding the state of the art practice.
- Health disparities between poor and wealth populations, urban and rural zones show the clear differences in health services access. \textsuperscript{1}
The objective of this study is to do a comparison between the health systems in a few selected countries in Europe. For this study 8 countries were chosen: Switzerland, Germany, France, Italy, Netherlands, Spain, United Kingdom and Sweden. This countries choice was made in function of their different health systems. The assumed availability of information was as well another criteria for this selection.

The focus of the analysis will be the dental care. The aspects to be discussed are the kind of service provided and the financing system. If relevant data is found, we will try to establish the relationship of the dental care system and the outcomes regarding oral health in the different populations.

2. Oral health system per country

In this chapter an overview of the health system will be done for each of the selected countries regarding the type of service delivery organization and the financing system.

2.1 Switzerland

2.1.1 Service delivery

In Switzerland there are 4500 actively working. Most of them work as general practice and around 50% work in single practices.

There are only 4 specialties recognized by the Swiss Society of Odonto-Stomatology (SSO): Orthodontics (260 dentists), Periodontics (102 dentists), Prosthodontics (61 dentists) and Oral Surgery (154 dentists)

Around 45% of the dentists come from abroad, mainly from Germany, Italy and France. The dental market in Switzerland seems to be attractive as the local dental association confirms that no dentist is unemployed in the country.

Nevertheless, we can notice that group clinics are more popular and dentists have a tendency to search for this kind of work because of the structure offered in terms of installations, marketing and administration. Therefore, the dental professionals can focus their working time on their domain of expertise.

There are 5 types of dental auxiliary, largely employed for their qualifications:

Dental hygienists (1500) – After following a 3 years qualification in school, they are allowed to perform simple periodontal scaling, oral hygiene instruction and application of sealants. In a few cantons they are permitted to apply local anesthesia. The dental Hygienists are meant to work under dentist supervision in most of the cantons. They are employed by private and public practices and independent work is allowed in a few cantons.

Dental Technicians (2200) – All the prosthetics construction is done by them. Nevertheless, they are not allowed to work in the mouth of the patients. Their work is based on the impressions that dentists send to the laboratory. They are meant to train during 4 years in a laboratory before they get registered but only a few cantons actually require the federal registration.

Denturists (60) – This profession exists only in a few cantons and it is not very popular. The denturists can provide the patients only with removable prosthetics. The insurances don’t usually pay for their services.
Prophylaxis assistants (250) – They are trained by the SSO on a short theoretical program and their qualification is mainly based on the practical working. Their first function in the dental office is the removal of supragingival deposits. Independent work is not allowed.

Dental Assistants (5500) – Dental assistants have a 3 years qualification program, which permits the assistance at the chair side, office administration, patient’s management and material and equipment organization. This profession is largely employed by private and public practices, resulting in average 2.5 dental assistants for each treatment performed by a dentist.

Sources: 7, 8, 9, 10

2.1.2 Financing system
Switzerland is one of the countries which have a mandatory public health insurance system. Part of the financing comes from the fees paid to the insurance caisses, other part comes from taxes and a third part comes from the out of pocket contributions (quote-part and franchise)

Dental care is only paid by the public system in specific cases:

- Oral conditions caused by another severe and not avoidable disease of the masticator system.
- Oral conditions caused by another severe condition and its sequel.
- Oral conditions which must be treated in the overall treatment of another severe disease.
- Oral conditions caused by accidents.

The government guarantees the oral health promotion in the schools. Children are examined and dental treatments are recommended if necessary.

This means that mostly the dental care is paid directly out of pocket for private services. 10% of the population has a private dental insurance, covering the costs of dental care.

The prices of dental treatments are controlled by the Société Suisse d’Odonto-Stomatologie. For each dental procedure, a code is given and a number of points are attributed. The value of the point in Swiss Francs is determinate and fixed for all the treatments to be covered by the public health system.

For the private treatments, paid directly by the patient, the value of the point has no base limit, but has a maximum limit which must be respected by all the dentists.

In an overall view expenditure for oral health is 0.12% of the GDP.

Sources: 7, 8, 9, 10

2.2 Germany

2.2.1 Service delivery
There are 65629 dentists actively working in Germany (data from 2008). The great majority work as general practitioners. The specialties recognized are Oral Surgery (2048) Orthodontics (3309) Periodontology (40) Dental Public Health (480).

96% of the dentists are working in private offices, other are in universities, public dental offices, hospitals or army

Auxiliars
Dental Assistants: there are different grades of dental assistant (Zahnmedizinische Fachangestellte), depending on their training:
Zahnmedizinische Fachassistentin (ZMF): After 700 hours training in a dental office, they are qualified to support in prevention therapies, organization and administration of the dental practice.
Zahnmedizinische Prophylaxeassistentin (ZMP): A 350 hours training allows them to support in prevention therapies and to inform patient about oral health.
Zahnmedizinische Verwaltungsassistentin (ZMV): They have a 350 hours training in order to perform the organization of the dental office and train the Zahnmedizinische Fachangestellte.
In total, there are 170000 Dental assistants in Germany.

Dental Hygienists: (350) their duties are the motivation of patients, prophylaxis treatments and teeth scaling.

Dental Technicians: (58000) Prosthetics construction is done by them. Nevertheless, they are not allowed to work in the mouth of the patients. Their work is based on the impressions that dentists send to the laboratory. They train for 3 years in order to get this certification.

2.2.2 Financing System

Germany has two types of oral health insurance: the statutory, which covers the expenses of employees and their dependents that have an income lower than a specified amount; and the private insurance for all those who are not entitled to the statutory insurance.

Dental expenses are covered by the statutory insurance, through a system of regional dental authorities which receive the reimbursements from the sick funds and distribute to the dentists.

General clinic procedures are totally covered by the insurance. Prosthetics are covered at 50% and orthodontics at 80%. Implants are not covered.

With this system Germany reaches the impressive percentage of ~70% of the adult population and 75% of the children using the dental system.

Since 2004, Germany applies a certain form of moderator ticket of €10 per each consultation per quarter.

Private insurances for dental care can be contracted by those who do not participate in the statutory scheme. Coverage and fees are in this case flexible and negotiated between the parties.

The dental treatment prices are negotiated between the regional sick funds and the KZVs. KZVs are the 22 self-governing regional authorities, which every dentist has to be a member of in order to treat patients in the social security system. The KZVs are the key partners with the sick funds, holding budgets and paying dentists.

The total oral health expenditure is 0.8% of the GDP.

Sources: 7, 11
2.3 France

2.3.1 Services delivery

There are 40,968 dentists actively working in France. This brings France a dentist to population ratio of 1.556 (data from 2008). Government detects a decrease of this ratio and therefore more dental students will be taken in order to avoid a shortage of dental surgeons by 2015.

About 85% of the dentists work in private practice, 6% in public dental services and 9% distributed in hospitals, armed forces universities, etc.

The dental school are all state funded. The number of student’s admission is determined by the Ministry each year depending on the health system’s need.

The dentist’s education has duration of 6 years. The profession’s title was until 1972 Chirurgien Dentiste and then Docteur en Chirurgie Dentaire.

Only one specialty is recognized in France: the orthodontics, which training takes 4 years. Around 5% of the dentists specialize in orthodontics.

The Oral Surgery specialization is recognized as part of the medical school.

There are no schemes to control the patient’s access to these specialists.

Continuing education is mandatory for dentists since 2004, when the entire health system was reformed. A body is controlling the educational programs as well as setting validating the credits received. Dentists must have at least 800 credits within 5 year (minimum 150 per year).

Auxiliaries

Dental technicians – they undertake a minimum of 3 years training in laboratories and schools. They are not allowed to work directly to the patients.

Dental assistants – they have a 2 years training in dental practices and schools. They cannot work in patient’s mouth.

2.3.2 Financing System

Every person living legally in France has the right on the public health system financed mainly by the Social security system. There’s a contribution of 12.8% of the employees paid by the employer and 0.75% paid by the employee. Further, there’s a personal income tax of 5.5% in order to sustain the public health system. Co-payments complete the cost of the health care.

Almost of the dental treatments are performed by liberal dentists (99%) according to an agreement called the Convention. After a discussion between the caisses and the dental associations, the fees for dental procedures are established and every dentist working under the convention system has to follow it.

The patients pay directly to the dentist the total amount of the treatment and then they can claim the reimbursement of a part of the cost to the caisse, as follows:

- Conservative and surgical treatments: 70%
- Prevention and examination at the age of 6, 9, 12, 15 and 18: 100%
- Orthodontics and prosthodontics treatments require the prior approval of the estimated values by the caisse, which usually covers part of it.

There’s no system to limit the number of treatments.
Private insurances are largely contracted by the French people. Around 90% have one complementary insurance scheme in order to cover the part of the treatments not paid by the social security caisses.

The total oral health expenditure is represents 0.6% of the GDP.

Sources: 1, 7

2.4 Italy

2.4.1 Service delivery

The dental schools are all state owned and have 5 years duration. Together, the 34 schools in Italy take around 850 students per year.

After graduating, the dentists must follow continuing education programs and cumulate 150 units of CPE within a 3 year period (30-70 per year)

There are only two specializations recognized: Orthodontics and Oral Surgery.

Italy has 48000 dentists registered and active in practice (data from 2007). A low percentage is formed by specialists (orthodontics: 3% and oral surgery: 0.1%)

93% of the dentists work in private practice. Less than 5 % are working in public practices and the rest is distributed in universities, hospitals and armed forces.

Auxiliaries

Dental Chairside Assistants: 52000 – usually they’re trained inside the private practices, but there are as well 1-2 years certificates for this function provided by regional schools. These assistants cannot work directly in the patient’s mouth.

Dental Hygienists: 4000 – a 3 years program delivered by universities is required before entering the dental hygiene function. They’re allowed to give hygiene instructions, scaling and dietary advice.

Dental technicians: 11520 – the training is undertaken in independent technical schools during 4-5 years. They can work then under the dentist prescription, never directly in the patient’s mouth.

2.4.2 Financing system

Italy has a national health service. Therefore, in the theory, all dental treatments should be covered by the public system, except implants.

But this concept is not applied in the reality. Because of historic reasons, the health system in Italy differs a lot from one region to another.

The 4 aspects below are considered in order to define the eligibility for dental procedures covered by the public system:

The concerned national regulations define based on the LEA (Essential level of assistance) that the oral health services to be provided by the NHS are:

1. Dental health care programs for children at the age of 0 to 14 years old.
   The objectives of the program are the monitoring of decays and occlusion, treatment of caries and correction of most risky occlusion pathologies.
   There’s no limitation for dental diagnosis visits and the treatments provided include extractions, periodontal scaling and surgery, etc.

2. Particular vulnerability conditions.
The sanitary vulnerability is defined by other health conditions which can be worsened or be compromised by oral diseases. It includes as well diseases which are often associated with dental conditions. Six conditions are defined for the sanitary vulnerability: severe immunodeficiency, Oncoematological pathologies in children, patients under radiotherapeutic treatments of neoplasias and severe bleeding.

Social Vulnerability is applied to people in social exclusion, poverty or low-middle income. The regional eligible subjects receive dental examinations, conservative treatments and extractions.

For the general population, not part of the particular groups described above, the NHS provides dental examinations, urgent treatments as severe infections, bleeding and severe pain.

As mentioned priorly the dental care delivered by the NHS varies a lot according to the region and don’t always follow the base national regulations. For instance:

- in Valle d’Aosta young (< 16 years) and adults with the minimum social level of income are ensured free services;
- in Marche young people (< 18 years), old people (>65 years) and handicap people access to free dental care;
- In Umbria young (< 14 years), unemployed, retired with low incomes, some selected categories of handicap people have right to free assistance.

Orthodontic and prosthetic treatments are not usually covered and in many areas, only urgencies are treated.

In Italy, 1.4% of the GDP is spent on oral health. 97% of this cost is expenditures in private practices. In 2003 one family would spend €1300 per year with dental care.

Private insurances are not yet very popular as they’re not often included in the healthcare insurances package. Nevertheless this picture is changing and the insurances companies are developing the dental care insurance models.

Sources: 1,12,13

2.5 Netherlands

2.5.1 Service Delivery

There are 3 dental schools in the country taking 300 students per year. They’re all state-funded but the students have to pay for it. The duration of the dental studies is 6 years.

After the graduation, continuing education programs are not mandatory for dentists.

1. The recognized specialties are Orthodontics and Oral and Maxillo Facial Surgery.

There are 8791 dentists actively working in the Netherlands. Only 3% are specialized in orthodontics and 2.4% in Oral and Maxillo Facial Surgery.

85% of the active dentists work in the private sector. The specialists in OMFS are working in hospitals and the rest is distributed in the armed forces and public practices.

Auxiliaries
Dental assistants: 16400 – They’re usually trained by individual dentists in their private practices although there are training schools which deliver the Dental assistant certification. Under the dentist’s responsibility they’re allowed to perform scaling procedures.

Dental Hygienists: 2260 – It’s considered a paramedical profession with independent status. Dental Hygienists must have a diploma from the dental hygiene school through a 4 years program. They are permitted to work independently from the dentist. There are a few courses which train the DH on simple routine treatments as fillings and extractions for children. Under the responsibility of the dentist they’re then allowed to perform these procedures.

Dental technicians: 5000 – they have a 2-4 years part-time training and deliver prosthetics under the dentist prescription.

Denturists: 290 – after a 3 years part-time training they’re only allowed to deliver full dentures.

2.5.2 Financing system

Since 2006 the Netherlands have a new health system. A compulsory health insurance is provided to the Dutch population by private insurances. This insurance package is the same for everyone and includes the basic health curative care. Other complementary insurances can be contracted as well to cover treatments not included in the basic mandatory package.

Concerning the oral care, the basic insurance covers:
- All preventive and curative care for individuals up to 21 years old.
- Full set of dentures
- Care for subjects with specific conditions like Physical or mental handicapped.

All the other treatments can be covered by complementary insurances.

Source: 1

2.6 United Kingdom

2.6.1 Services delivery

There are 15 dental schools in the UK, which admit 1063 new students per year. After graduating, dentists must participate in 250h of continuing education programs in each 5 years period.

There are 12 specialties recognized. Dentists may take from 5 to 7 years to have these degrees:
- Oral Surgery
- Endodontics
- Orthodontics
- Restorative Dentistry
- Prosthodontics
- Dental public health
- Oral medicine
- Pediatric dentistry
- Oral microbiology
- Oral pathology
- Dental and Maxillofacial Radiology

31000 dentists are actively in practice in the country. 12% of them are specialists.
77% of them are working in private practices, 6% in public dental services and 6% in hospitals. The rest is distributed in the armed forces, universities, and administrative functions.

Auxiliaries
Dental Hygienist: 5340 – After a 2 to 3 years training in the hygiene schools, their tasks include preventive therapies, anesthesia, scaling and root planning, etc. They must work according to a dentist’s treatment plan.

Dental therapists: 1154 – This professionals have a higher education and training then the dental hygienists. Their tasks after a 3 years full time program include the preventive care, periodontal scaling and root planning, anesthesia, fillings, pulpotomie and extraction of primary teeth, pre formed crowns on primary teeth, etc. They must as well work according to a dentist’s initial diagnostic and treatment plan.

Orthodontic Therapist: 10 – these are specialized orthodontics assistants are the first of their kind. This new profession started in 2008. They have the function of helping the dentists with the preparation of the patient for brackets placement, take impressions and other simple task of assistance.

Dental Technicians: 7094 – They train for 4 years in schools and are responsible for producing dental technical work to the prescription of the dentist, but cannot work in the mouth.

Clinical dental technicians: 93 – This is another new profession, existing since 2008. The CDT can provide the patient with full dentures without depending on the dentist. For partial dentures, the dentist must have prescribed it.

Dental nurses: 40665 – These dental chairside assistants are in charge of the infection control, assistance of the dentist during procedures, radiographs processing, etc.

2.6.2 Financing system

The UK has a National Health Service. The system is financed mainly by general taxation (95%). The balance is done by charges to patients for prescriptions, dental and optical care.

For the dental care, patients have co-payments. Oral health expenditures are financed 40% for the NHS and 60% by patient’s co-payments.

Special groups of people receive the dental treatment without having to pay anything:

- Children under 18 years old
- Pregnant and nursing mothers
- Individuals on welfare benefits
- Individuals under 19 years old in full time education

Private complementary insurances for dental care are not very developed in the UK. Less than 10% of the population has one. The largest insurance scheme is capitation system to the registered dentists, who take the financial risk on the provided treatments.

Sources: 1, 14, 15

2.7 Spain

2.7.1 Service Delivery

Spain has 17 dental schools taking 2900 students per year. After graduating the dentists are not yet obligated to follow a continuing education program, but this is being developed.

There are no specialties training recognized in the country.

From the 24000 dentists in active practice, 92% are working in private practices. The rest is distributed in the public services, universities, hospitals and armed forces.

Auxiliaries
Dental Hygienists: 9000 - They are trained in school for 2 years and are allowed to carry prophylaxis therapies and oral health education under the supervision of a dentist.
Technicians: 7500 - They follow a 2 years training at schools and are permitted to work in dental laboratories under the prescription of a dentist.
Assistants: 25000 – Chairside assistants have no formal training in schools. They are trained by the dentists in private practices.

2.7.2 Financing system

Spain has a National Health System which is mainly financed by the deductions on the workers income. These deductions are proportional to the income amounts and every year the government sets the minimum income which starts to have deductions.

The population has the right to all primary health care. The dental, psychiatric and cosmetic services are not in the list of services provided by this system.

Each region has a small Public dental service delivering free urgent treatments to the population, for example extractions and prescription of antibiotics.

There are a few regions which introduced a capitation scheme, but only for children from 6 to 15 years old.

18% of the Spanish population uses private complementary insurances for their private dental care.

Sources: 1, 16

2.8 Sweden

2.8.1 Services delivery

There are 4 dental schools in Sweden where 247 students are accepted per year. After the 5 years course continuing education is optional.
8 specialties are recognized in Sweden. The degree is given after a 3 years specialist program:
  Orthodontics
  Endodontics
  Paedodontics
  Periodontology
  Prosthodontics
  Dentomaxillofacial radiology
  Oral and maxillofacial surgery
  Stomatognathic physiology

From the 14355 dentists in active practice in Sweden, only 818 are specialists (6%).

The dentists are equally distributed in the private and public practices.

Auxiliaries
  Dental hygienists: 3194 - To obtain their university degree, they go to the hygiene school or 2-3 years. Their duties may include diagnosis of caries and periodontal disease, and they may provide temporary fillings and local anesthesia
  Dental technicians: 1200 - After a 3 years training at the dental school, they’re allowed to work in laboratories under the prescription of a dentist.
Orthodontic Auxiliaries: 360 - These assistants are trained on one year and can deliver the specific assistance for orthodontists

Assistants: 11274 – Since 2008 there’s a common national education for dental nurses. Most of them are working for the public system.

2.8.2 Financing System

Sweden has a National Health System with general taxation funds. The population receives health treatments including dental care only having to pay a medical visit fee.

In the 2002 New Dental Care Reform, high-cost protection schemes for patients above 64 years of age were implemented. However, charges for dental care were still be high, and about 60% of total expenditure for dental care was paid directly by patients.

Since 2008, a new system was introduced for dental care. It has 3 bases as follows:

- Dental Care voucher: for adults between 30 and 74 years old, the voucher is €32. Those between 20 and 29 or over 75 years old receive a voucher of €64 every second year.

- High-cost protection: The National health system reimburses at 50% the treatments between €321 and €1590. If the treatment exceeds €1590, 85% will be reimbursed. Although the dentists are free to set up their fees, the public health system has a list of reference prices on which the reimbursement scheme is based.

- Reimbursement: Preventive care and disease treatment are prioritized. In order to be reimbursed the treatment must be effective and socioeconomically efficient.

Sources: 1, 17, 18
3 Comparative analyses

3.1 Dentistry workforce

Chart 1. Service delivery by number of active dentists, 2009

Chart 2. Dentist to population ratio
3.2 Expenditures on oral health

Chart 2. Dentist to population ratio, 2009

Chart 3. % of GDP spent on oral health

3.3 Oral Health Outcomes
The chart 4 highlights the dental caries experience among 12-year-old children in the selected European countries, based on the DMFT (Decayed, Missing and Filled Teeth) Index, which measures the lifetime experience of dental caries in permanent dentition. Spain has the highest index (1.33). The government established the goal to reduce this figure to 1 by 2015. In order to achieve the proposed goals, all health system personnel should be involved and new oral health programs and strategies are recommended to be created. The most performing country regarding this oral health indicator is Germany, which has a relatively high financial investment on the oral care and counts one of the lowest ratio dentist population among the selected countries.

Chart 4. DMFT at age 12 and % GDP spent on oral health
On the Chart 1 we can observe the number of dentists in each country and the number of professionals allowed to perform the teeth cleaning and other preventive care (nominated prophylaxis staff). Together, they form the total number of direct oral care providers.

The expenditure on oral care combined with the prevalence of dental caries in the selected countries. It seems that there’s no correlation between these two parameters. (chart 3 and 4)

We could believe from this information that the resources are not being well distributed or applied, creating a non cost effective system. Italy for instance has a high expenditure on oral health compared to the other countries. The use of the financial resources doesn’t lead this country to an exceptional performance in the dental caries outcomes.

Regarding the DMFT at age 12 indicator, the most important action of the public health system would be the prevention programs for children. Most of the countries have a special attention to this kind of program, having prophylaxis professional inside the public schools in order to exam children and recommend dental treatments if necessary. The preventive and curative care is largely covered by the public system until the age of 14-15 years.

The fact that a country has a high or low number of professionals trained to act in the preventive field, as dental hygienists, (Chart 1) doesn’t seem to play a critical role in the prevention of dental caries in children. This absence of impact is not expected, as these professions were created exactly to make the access of the population to dental care more simple and easy.

Dental caries is a major concern in the European countries. This disease affects at least 60% of the children and the majority of adults. This problem seems to have a very strong relation with the industrialization, due to consumption of sugars.

Caries and gingival diseases are the most common oral disorders and it is well known in the literature that these conditions can be largely prevented. The oral disorders are determinate by the access to health services, socio-cultural and environmental factors.
3 Fluoridation prevention schemes

The effect of the fluoride in the prevention of dental caries has been studied since 100 years ago with the focus on the link between water and fluorides and dental caries and fluorosis, topical fluoride applications, fluoride toothpastes, and salt and milk fluoridation. Significant reduction of the prevalence of dental caries through water fluoridation and use of fluoride toothpastes and mouthrinses was the conclusion on many reviews. WHO recommends for public health that every effort must be made to develop affordable fluoridated toothpastes for use in developing countries. Water fluoridation, fluoridation of salt and milk fluoridation schemes are suggested to be considered for the prevention of dental caries.  

Research has shown that fluoride is most effective in dental caries prevention when a low level of fluoride is constantly maintained in the oral cavity. The goal of community-based public health programmes, therefore, is to implement the most appropriate means of maintaining a constant low level of fluoride in as many mouths as possible. Fluorides can be obtained from fluoridated drinking-water, salt, milk, mouthrinse or toothpaste, as well as from professionally applied fluorides; in the form of gel or varnish. The combination of methods seems to be chosen by most of the countries in order to guarantee the diffusion of this preventive substance. The evidence of the benefit from consuming fluoride reducing caries levels was largely studied since the 1940s. The benefits of water fluoridation in controlling dental caries are well documented. Fluoride was first used in water for caries control in 1945 and 1946 in the United States and Canada, respectively.  

The first time a relationship between teeth and fluoride was done, it was about the enamel fluorosis. Later, the association to caries experience reduction was formed. During the 1940s and 1950s, the fluoride was believed to be an advantage when consumed at least during the formative period of the dentition. Fluoride was thought to be significantly beneficial only in the development phase of the teeth, being not really effective for people over 5-6 years old.  

Review of human epidemiologic data refer to the study in the United States, where children receiving water with a high natural fluoride level (8ppm) experienced less than half of the caries compared to those who consumed fluoride deficient water. He refers as well to another confirmation of the fluoride effect, this time in adults who had ingested fluoride water only during
their first years of childhood. These adults had 32% less caries than the other adults not exposed to the substance.23

These findings supported the use of the fluoride only during the childhood. Later Dutch investigators have looked at the relative pre- and post eruptive effect of fluoride by comparing the effectiveness in caries prevention in children of different ages at the onset of water fluoridation. They compared caries increments in the Netherlands in fluoridated Til1 and Culemborg, the nonfluoridated control community. They concluded that fluoride had an important pre- and post eruptive effect on caries in permanent teeth. On approximal surfaces 50 percent of the benefit was preeruptive and 50 percent of the benefit was post eruptive, whereas in pits and fissures 66 percent of the caries prevention was preeruptive and 33 percent was post eruptive. On free smooth surfaces, reduction was 25 percent preeruptive and 75 percent post eruptive.24

In 1996 the caries prevalence of schoolchildren living in a district of Berlin, Germany, was higher than the mean of total Berlin. A special preventive program including the application of fluoride varnish was initiated. All 49 primary schools of the district joined the project. The program included oral health education as well as the application of a highly concentrated fluoride varnish. A total of 80,589 dental records were used for data analysis. A decline of DMFT-values was observed in all age groups and school years. The major improvement was found when the program had been established for four years.25

In 1997 a research in Bulgaria investigated the caries-reducing effects of amine fluoride toothpaste. The fluoride toothpaste was used in a community oral disease preventive program where the population previously had no exposure to it. 12,500 children - 12 years of age were provided with toothpaste. Amine fluoride dentifrice seemed to provide a reduction in dental caries prevalence compatible to the most commonly used fluoride dentifrice compounds.26

However, there are some undesirable side-effects of excessive fluoride intake. The over consumption of fluoride can result in fluorosis. Fluoride-associated opacities (FOP) of enamel are caused by excessive fluoride intake during the phases of enamel formation and enamel maturation. This results in the formation of hypomineralised enamel. The mildest form of FOP manifests as white horizontal lines in enamel and/or “snow caps” on the incisal edges and cusps of teeth. The most severe form appears as heavily stained, friable enamel with pitting. The prevalence of FOP is dependent upon the fluoride intake in the first years of life.27 In a recent systematic review of water fluoridation, it was concluded that dental fluorosis of aesthetic concern affected 12.5% of residents of fluoridated communities. This was based on a survey of 12-year-old children in the UK.28 Experience has shown that it may not be possible to achieve effective fluoride-based caries prevention without some degree of dental fluorosis, regardless of which methods are chosen to maintain a low level of fluoride in the mouth. It is the responsibility of each government to implement the provide fluoridation in order to maximize the benefits and reduce the levels of dental fluorosis of the population.2

According to the Forum on Fluoridation 2002, lowering the fluoride level in drinking water to between 0.6 and 0.8 ppm with a target value of 0.7 ppm will be sufficient to bring about considerable reductions in dental decay.29

Fluoride is being widely used on a global scale, with much benefit. More than 500 million people worldwide use fluoridated toothpaste, about 210 million people benefit from fluoridated water, some 40 million people from fluoridated salt, while other forms of fluoride applications (clinical topical fluorides, mouthrinses, tablets/drops) are used mainly in the developed countries.2

Fluoride varnish offers important advantages in the public health setting. This is especially so in the context of increasing concerns about the devastating effects of early childhood caries and the difficulties many children affected by the disease have gaining access to care. Fluoride varnish can be successfully applied in most young children and there is no risk of overingestion of fluoride.
These advantages make it possible to apply fluoride varnish safely to the newly erupting teeth of high-risk infants and young children in an effort to control the caries. 30

In Europe, the most common method for the distribution of fluoride to the population is through fluoridated salt. (Table 1) While roughly 13 million Europeans have access to fluoridated water, approximately 50 million EU citizens consume fluoridated salt. European countries which currently have fluoridated salt on the market include Germany, France, Belgium, Austria, Switzerland and the Czech Republic. No country has banned the use of fluoride. Some countries have decided against water fluoridation for practical or political reasons. For example, in France there are over 20,000 separate public water sources, which make water fluoridation technically difficult. Under these circumstances, other methods of delivery such as fluoridated salt, fluoridated milk, fluoride mouthrinses and fluoride toothpaste have been employed to deliver fluoride to the population. 29

Several communities having initially started water fluoridation schemes have since ceased. The reasons to discontinue are usually complex. The Government in the Netherlands did not persist with water fluoridation because it was unable to supply fluoridated and nonfluoridated water to adjacent towns depending on the decision reached by communities sharing the same water supply. A body established by the Swedish government advised that water fluoridation should proceed. A bill was prepared but not enacted.29

<table>
<thead>
<tr>
<th>Country</th>
<th>Fluoridation scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switzerland</td>
<td>Salt</td>
</tr>
<tr>
<td>Germany</td>
<td>Salt</td>
</tr>
<tr>
<td>France</td>
<td>Salt</td>
</tr>
<tr>
<td>Italy</td>
<td>None</td>
</tr>
<tr>
<td>Netherlands</td>
<td>None</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Water</td>
</tr>
<tr>
<td>Spain</td>
<td>Water (in some of the main cities)</td>
</tr>
<tr>
<td>Sweden</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 1. Fluoridation schemes per country

The difference between countries regarding the implementation or not of public fluoridation cannot explain the similar levels of dental caries experienced by 12 years old children. (Table 1, Chart 5) The fact that some of the selected countries have natural fluoridation of spring waters or even the level of fluoride in the normal diet is already enough probably hides the real effect of the fluoride use. This natural fluoride can compensate the difference between countries and mask the real benefit of its consumption.
5 Discussion

For this study, oral health data has been extremely difficult to find. Dental health economics is not a topic which is largely studied. One given reason is that the dental illness has some different features to the general health. General health is special because it is unpredictable and the demand increases as the person is ill. Another characteristic is that people don’t really know how to evaluate the quality of the treatment as it requires a very specialized knowledge. 31

The case of the dental care does not follow the general health features: the dental illnesses are relatively few compared to the general health. In another hand they’re very common and most of the people experience dental illness several times during a lifetime. These multiple treatment experiences makes individuals aware of the dental illness and the treatment required. This way they can better evaluate the quality of the treatment provided. 32

Dental treatments are not emergencies, except for a few cases. Whenever there’s no pain symptom, most of the time the treatment is postponed by the patients if the moment is not convenient for any reason. 31, 32

The economic evaluation of the dental care is challenging. Although it is a restricted domain in the overall health care, it causes a big economic impact due to the complexity and duration of treatments. So far, there’s not much data collected on dental health indicators for the European countries. The usual indicator DMFT tells the presence of absence of teeth affected by caries. This represents a major limitation for cost effectiveness evaluation. The indicator does not make a difference of the quality of the tooth. In example, the indicator gives the same score for filled and missing teeth. 33

Oral and dental health of Europeans is particularly susceptible to economic factors. In most European countries, dental care for the general population is financed from private sources to a greater extent than other kinds of healthcare. The dental health not being usually urgencies, people tend not to search for treatments in times of crisis.
In order to measure the impact of the dental diseases in the European populations and to be able to have a better understanding of the cost effectiveness and cost benefit of the oral health systems, one project was launched by the WHO in 2002. The Global Oral Health Indicators Development Project (Convention SPC 2002472) has the goal to establish priorities for a specifically European context to make new recommendations for improving health system performance when necessary. Therefore a commission was formed to analyze and define the right health indicators related to oral health for all the participating countries to use. The argument in favor of developing a plan linked to oral health indicators within the European Programme of Surveillance is based on an analysis of the current situation and the need to organize oral health system monitoring.  

The link between periodontal disease and other severe systemic condition being one important topic under development, lead the WHO to determinate one of the goals in oral health for 2020: “To minimize the impact of oral and craniofacial manifestations of systemic diseases on individuals and society, and to use these manifestations for early diagnosis, prevention and effective management of systemic diseases.”  

6 Conclusions

This study had the objective to describe compare the oral health systems in Europe by selecting countries which exhibit different profiles. It was very useful for me to make this research and to learn about the possibilities of service delivery and funding systems. It was for me a first contact with the oral health public and private systems. This experience could clarify a global overview of the European scenario, going beyond the private practice and patient management with local politics and systems.

There’s a big difference between the type of service deliveries of each country regarding the qualification and profession titles.

The dental care is not often covered by the public health systems or only partially covered. Unfortunately the dental health data is extremely poor and cannot give a basis for cost-benefit or cost-effectiveness credible ratios. There is tough a promising future for data collection in this area driven by the World Health Organization, with carefully designed indicators and parameters.

Concerning the cost of oral health, the data is not very precise, as most of the treatments are done in a private sector. There, we cannot distinguish the basic care which fights against diseases of and the elective treatments like esthetics procedures.

In Switzerland a research on the oral health costs could maybe be done by the data provided by the taxes office. The population usually uses the dental care to deduct taxes.

In Sweden probably we could find the most precise data about public oral health expenditures. The government paying for an important part of these should have the data necessary about public expenditures and out-of-pockets.

Once this new surveillance takes place, it will be easier to compare the data between countries and act consequently in a corrective way to improve the services delivery.
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