

# INTERNATIONAL SYMPOSIUM ON PAST AND FUTURE TRENDS OF HEALTH WORKFORCE (Barcelona, Spain, 21-23 April 2005)

## **Trends in dental manpower and utilization of dental services in Catalonia (1991-2003).**

E CASALS\*, E CUENCA\*\*.

\*Health Department – Generalitat de Catalunya. Mother and Child Health Program

\*\*Dental School– University of Barcelona. Department of Community and Preventive Dentistry

### 0. ABSTRACT

**OBJECTIVE** This study was designed to describe the sharp increase in the catalan dental workforce in an scenario of low utilization of dental services, low burden of disease and a delivery of services mainly based on a private fee-for-service system which enrolls more than 92% of dental professionals. **BACKGROUND** Previous research has shown an outrageous increase of the spanish dental workforce and the catalan dentist-to-population ratio followed a similar trend. Meanwhile there has been only a mild growth in the catalan population. The increase in dental manpower has been associated with supplier induced demand. **METHODS** Data regarding utilization of dental services in Catalonia (visits/year) were obtained from the Catalan Health Survey (1994, 2002), Spanish National Health Survey (1987, 1993, 1995 1997 and 2001) as well as from the Family Budgets Continuous Survey (1985-95). Data regarding evolution of dentists in Catalonia and Spain were collected from the professional dental association's censuses. Dental use ratio determinants were calculated. **RESULTS** There has been a 141% increase in the catalan dental workforce (dentists) in the 1980-90 decade, a 95% increase in the 1990-2000 decade and the evolution 2000-04 showed an 36% additional increase. This dramatic increase is associated to the opening of new dental schools (public and private) and therefore a higher number of graduates plus the immigration of dental professionals with foreign diplomas (representing in 2004 a 34,5% of dentists). Data show that there is still a very high demand for dentistry among students entering the university, being dentistry among the top five most requested degrees at all 12 public universities in Spain (2003-04). Data also show that private dental schools receive more applicants than their available capacity. Catalonia's demografic evolution (6.8 milion inhabitants in 2004) shows an average 0.5% yearly increase (4,98% in the period 1991-2001) and its fecundity ratio is among the lowest in the world (1,38 -2003-) foreseeig a similar future trend. Caries epidemiological data show a continuous decline although dental attendance ratios and toothbrushing habits are still among the lowest in Europe. Catalonia's DMFT (12 year-old) has decreased from 2,98 (1983) to 1,6 (1991) and then to 0,9 (1997). Spanish last survey (2000) shows similar data (DMFT=1,1). However, according to the last catalan health survey (ESCA 2002), only 30,6% of men and 37,7% of women have visited a dentist in the last 12 months. Less than 11% of these visits are carried out by public

dental services. The strongest variable associated to dental use frequency is income.

CONCLUSIONS There has been a sudden increase in the dental workforce associated with a low utilization of dental services in a population with low disease level. Dental care delivery is mainly private-based so there is a future high risk for supplier induced demand. New policies on manpower planning and strategies to minimize barriers to care are needed. GRANTS Financed by the Catalan Dental Association (COEC).

## 1.INTRODUCTION

The aim of dentistry is to give a suitable answer to the needs of the population, in order to improve its health through the improvement of the oral health of its citizens. The possibility to meet this goal in the future, depends among others of the capacity of dentistry to reply to the needs and changing demands of the population. It also depends of its capacity to assure a suitable and balanced offer of competent professionals receptive to the demands of the population specially to that part of the community which find it harder and more difficult to access to oral health services: the underserved. Planning of resources in dental health is a component in the structure and organization of any health system and nowadays healthcare systems are considered one of the determiners of health in the community which serve. The XXIX World-Wide WHO Assembly, held more than 30 years ago, adopted the resolution WHA 29.72 in which it was stressed that there was a need to "intensify efforts to develop the concept of integrated development of health services and of human resources in order to promote systems that give answer to the needs of each country?". Imbalance of the health workforce remains today as a major concern in both developed and undeveloped countries and for most of the health care professions.

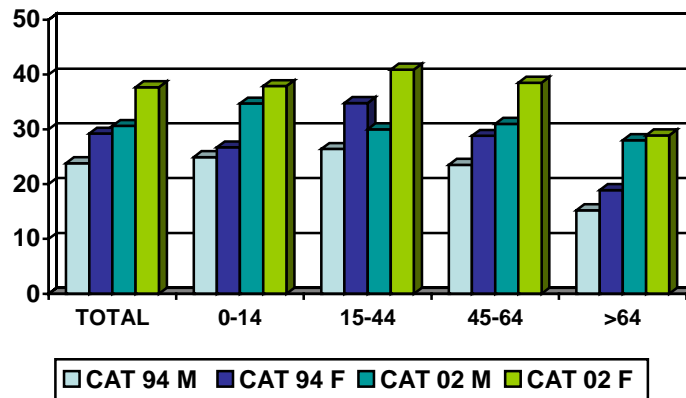
The planning of human resources in the health sector has to be an integral part of the process of health planning and should include all those processes which establish the best way to produce, distribute and employ the suitable amount of professionals, with a proper training, to make the healthcare system work. Therefore it needs to incorporate some quantitative aspects (number of necessary professionals) as well as some qualitative ones (training needed to develop the desired activities).

The starting of a planning process always obeys to a political determination, and few are the successful experiences of human health resources' planning in the field of health which are isolated from a political context. Planning without a political support is merely an academic exercise.

During the last twenty years, dentistry in Catalonia is, among all health professions, the one that probably has suffered the most important changes. Changes in its education, including a new diploma starting in 1986, and changes in its human resources, with a vertiginous demographic growth mainly based on immigration of dental professionals. Simultaneously, the epidemiological scenario of the most prevalent oral illnesses among the catalan population has changed

dramatically, with a decrease of some diseases, as dental caries, in some sectors like child and juvenile population.

Data from the last catalan survey, carried out in 2002 (CAT-02), regarding health and healthcare use, show that less than a half of the population has had a regular visit to a dental service in the last twelve months (Figure 1).

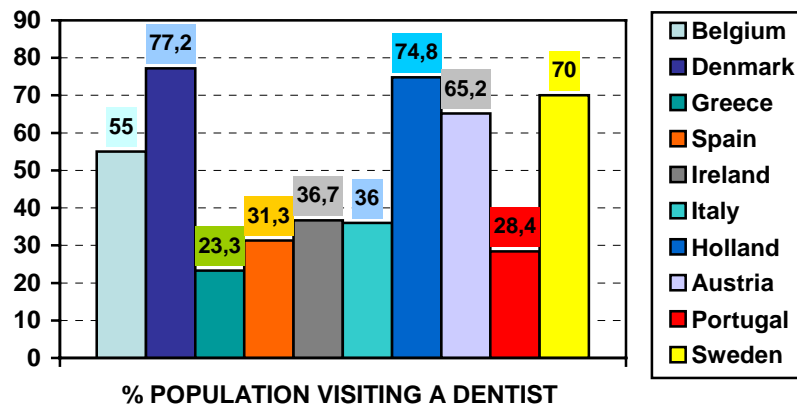


**Figure 1. Evolution of people attending a dentist during the last 12 months (by age cohorts) in Catalonia (1994-2002)<sup>1</sup>**

The exact figures show that only a 37,7% of catalan women have attended a dentist, while only a 30,6% of men did so, during the last twelve months. Even though these numbers show a positive trend compared to data from the same survey carried out in 1994 (CAT-94), when only 29,2% of women and 23,8% of men had attended a dentist in the last twelve months, they are still among the lowest in Europe. We can compare the numbers from some EU countries and only Greece (23,3%) and Portugal (28,8%) had percentages lower than the data for Spain with a 31,3% (Figure 2).

Nowadays, in Catalonia there are two dental schools: one public school at the University of Barcelona (UB), with approximately 500 registered students, and another private school at the International University of Catalonia (UIC), with about 600 registered students.

<sup>1</sup> Enquesta de Salut de Catalunya 2002 (Catalan Health Survey 2002). Departament de Sanitat i Seguretat Social. Barcelona: Generalitat de Catalunya, 2002.



**Figure 2. Evolution of people attending a dentist during the last 12 months (by age cohorts) in different EU countries<sup>2</sup>**

The number of dentists registered in the dental professional association has changed from a number of 1.303, in 1990, to more than the double in 2001 (2.723 registered dentists). This change in the number of dentists represented a 95% increase. Moreover, 63% of the dentists who worked in Catalonia in 2001 were less than 45 years old, and almost all of them worked within the private sector, given the limitations of the dental coverage offered by the public sector. The public sector, with its own net of salary-based dentists, only covers oral surgery for adults and some preventive care for children without including general restorative work. About 8% of dentists registered in the professional association work for public services even though this by no way means that they do not own their own private practice nor deliver dental services privately.

It seems there is an urgent need to apply a decided policy in planning of dental human resources, subordinated to goals and needs in oral health of the Catalan population.

## 2.CONCEPTUAL FRAMEWORK

The planning of health human resources (PLANNING OF HUMAN RESOURCES –PHR-) in general and therefore in dentistry, is a difficult task<sup>3</sup>. Difficult for the amount of variables and elements that they interoperate in a complex system. This complexity, is produced not only because of the purely methodological difficulties for a scientific approach to this subject, but also for the political load which entails. The confluence and often confrontation of interests from the several bodies and

<sup>2</sup> Health in Europe. Results from 1997-2000 surveys. European Commission. Theme 3 Population and social conditions. Table 2.9.2.2.2. page 155 (Average number of visits to the dentist during the last 12 months)

<sup>3</sup> Maupomé G, Hann HJ, Ray JM. Is there a sound basis for deciding how many dentists should be trained to meet the dental needs of the Canadian population? Systematic review of literature (1968-1999). J Can Dent Assoc 2001;67:87-91.

institutions implied in the planning of human resources in dentistry makes it difficult to consider it as a conceptual and methodologically neutral exercise.

Thus, health authorities are worried for the continuous increase of the sanitary expense and will favour measures to limit health care expenditures; professional unions and organizations watch over the maintenance of the economic and social status of their members seeking to increase their members' market power, employment and income; consumers ask for an improvement in the accessibility to dental services (specially about their costs) while educators and providers of human resources are worried about improving and increasing their offer. Unfortunately, quite often we forget that planning of human resources, by itself alone, it's not a purpose but an instrument to achieve the health objectives previously established.

As a matter of fact the raised question should be "Which are or will be the needs and demands of dental services in Catalonia?" instead of just a simple "Are there too many (or few) dentists in Catalonia?". To better understand the answer to this question it implies a knowledge, among others, of factors affecting health workforce imbalances like: population demography, professional demography, epidemiology of the more prevalent oral diseases, oral healthcare needs and demands, acquired and future professional competences, technological innovations and its impact in the professional practice, provision and funding of dental services, organizational models and its future trends as well as health policies and the role of the organized profession in its design. Planning of human resources in dentistry brings up some problems that affect its realization:

A. There is no agreement in relation to the ideal number of dentists to cover the needs of a determinate population. As a matter of fact, there is not even an agreement in the way of calculating this ideal proportion. Often the proportion of working dentists (not just graduated) for inhabitant is the only ratio available even though this figure does not give, as an example, any information regarding the quality of the professionals because when there is a shortage of workers even those professionals without a proper training fill in working vacancies because there is a need to recruit professionals. It neither gives us information related to the number of working hours nor the services developed during their working time so it is difficult to gauge an standard of equivalent productivity for a set of suppliers of oral health services.

B. It is easier to measure the labour offer than the needs and demands for dental services. There is still no ideal form of quantifying the real needs of a population from the epidemiological studies, neither translating these needs into expressed demand for dental services.

C. The projection in the offer of oral health services is confused by factors such as the creation of new dental schools, the migration of dental professionals or the imprecision in the professional competence of intermediate dental professionals such as hygienists or dental auxiliaries all of which impede the proper prospective measurement of the dentist/inhabitant ratios.

The used methodology and therefore the design of a study about human resources in dentistry will depend to a large extent of the purpose of the study. It might be brought up as an answer to the question: "Is there a sufficient demand to absorb an increase in the number of professionals?", but

also as a different question: "Until which level could demand be stimulated in order to absorb current and/or future offer of dentists?". The capacity to intervene in the system according to these approaches are based on only two possibilities. The first one is regulating the offer of dentists while the second one is increasing the demand for dental services.

Such a poor conceptual approach, would forget again that human resources' planning in dentistry is not a purpose in itself but an instrument to attain some health goals. However, a great number of planning studies focus in such concept which some authors name "the paradigm of lack of work", according to the belief that as long as the number of dentists is slightly inferior to the demand which the market can bear, the businesses will be good for the profession. Most of these studies are developed according to five different approaches:

*1. Projections of the dentist/inhabitant ratio.*

The estimations of production of new professionals from the dental schools' intake data, the possible migratory flows plus the projections of the number of retirements are calculated. Regarding the population data estimations are made from the census, and the estimated projections can be calculated annually until the date of reference. This type of study, relatively simple, has the inconvenient that the ratio established as desirable is quite arbitrary.

*2. Opinion surveys among professionals.*

A professional questionnaire is developed in order to get a description of the characteristics and professional structure of dental practices. According with the answers and opinions of the professionals related to their capacity of increasing their productive strength, conclusions are taken out in relation to the surplus or shortage of dental professionals. The main inconvenient of this kind of studies is the possible opinion biases of the polled professionals.

*3. Estimations about the stimulated demand that could be absorbed in a future, by suppliers of oral health services.*

In this case, emphasis is placed in the ways to measure all possible ways to stimulate dental demand among the population. A weak point of this approach is the difficulty of quantifying the possible impact which "campaigns to induce demand" have in relation to an hypothetical increase of the expressed demand of oral health services among the population.

*4. Econometric studies in the professional practice in relation to productivity*

Data analysis of a series of variables is carried out in order to relate them with the "output procedures" measured in the form of visits (patients treated and time consumed for a determinate period) so to relate these variables with the utilization or demand of oral health services. This type of approach assumes that it is the offer of professionals the one that defines the demand and not the opposite, however basing the question in the subject of productivity instead of health goals is always arguable in a health profession.

*5. Studies based on the measurement of needs and demands of dental attention.*

This type of study emphasizes the importance of measuring needs and demands through the study of the prevalence and incidence of the most common conditions and diseases among the target

population. Data are afterwards used in order to make estimations about the requirements for dentists to cover them. Carrying out this type of study is very complex. Among others, there is the difficulty of translating the detected needs into populations' expressed demands for treatment.

Planning of human resources in dentistry should be understood as one item in a complex system, where several components interact with the purpose to achieve a final goal: the improvement of the oral health of the population. Limiting a study of human resources' planning to a simple study of future demographic trends would avoid the core of the question, which it is no other than an answer to the question: are the disposable human resources the suitable ones –in quality and quantity -to give a satisfactory attention to the needs and demands in oral health of the catalan population?

Often the number of dentists is perceived as an important condition to the provision of oral health services, so that the availability of dentists would correlate with a better level of oral health of a given population. This hypothesis was considered by WHO<sup>4</sup>, in a very rigorous study, which analysed the impact that several systems had in the levels of oral health in eight different countries. This study analyzed how availability, accessibility and acceptance of dental systems influenced on the dental health of the studied populations. The study summarizes that "differences observed in the levels of oral health and non-covered needs of treatment were not associated with the limitations in the number and distribution of dentists, but maybe with other factors which influenced the system". Therefore the hypothesis initially brought up, which suggested that an increase in the number of dentists would be translated into an improvement of the oral health status and a decrease of treatment needs, was not corroborated by the data obtained in the study.

The number of dentists needed, to correctly cover the needs of the population, requires an analysis of very diverse variables which are those that shape a system with two main forces: the production-offer of dental services on one hand and the requirements of dental services in the other, according to Defriese and Baker<sup>5</sup>. Among these two forces there is an indeterminate space the width of which, in terms of shortage or excess of dentists, will depend on the difference between dentists' offer of services and the demand for those services. The set of elements that interact in these system are dynamic and changing and it is necessary to identify suitably the most relevant engines of change, with the purpose of evaluating its possible future impact in the evolution of this system.

### 3.VARIABLES OF OFFER AND DEMAND IN ORAL HEALTH

We will classify all variables according to their strongest relation to each one of the two main forces (even though they will also have an impact on the other force): a first one which is the production-offer of dentists and a second one related to the requirement for dental services.

---

<sup>4</sup> Chen M, Andersen RM, Barmes DE, Leclercq MH, Lyttel CS. Comparing oral health care systems. A second international collaborative study. Geneva: World Health Organization, 1997.

<sup>5</sup> DeFriese G, Barker B. The status of dental manpower research. J Dent Educ 1983;47:728-36.

### 3.1 VARIABLES WHICH AFFECT THE OFFER (PRODUCTION) IN ORAL HEALTH

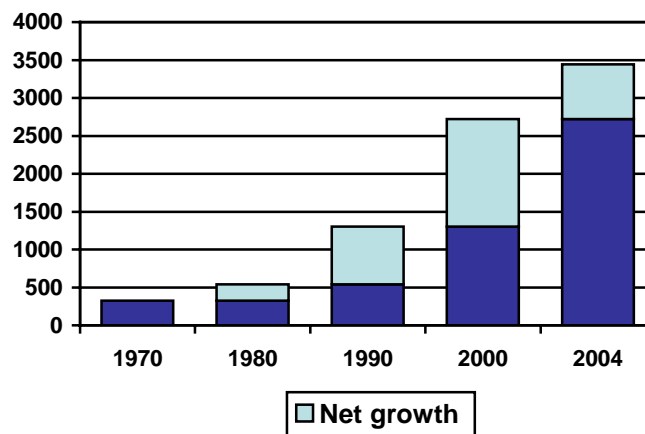
#### Professional demography (PD)

The production and offer of dentists has suffered, in the last twenty-five years, an extraordinary growth. Catalonia, as well as Spain, has changed from being considered in deficit of dentists to having an offer of professionals similar or even higher than the countries of its socioeconomic environment. This trend is sustained, according to current data, on the potential demand to enter dental schools as well as in the number of requests from foreign graduates to have their foreign diploma accredited. The changes in the professional demography in Catalonia, during the last twenty-five years, also show qualitative aspects of great significance, as the increasing incorporation of women to the profession plus a strong rejuvenation of this professional group.

The analysis of the professional demography not only entails the evolution of the number of dentists registered in the professional association (COEC), but also other qualitative variables that could affect the activity of the system in the future. Therefore it is important to study some variables related with professional demography such as: number, age, gender, qualification, immigration flows and demographic projections.

*PD: Number and evolution of dentists being registered in the professional association*

When we speak about professional offer we refer to the collective constituted by active professionals, but often we also refer to the future flow of new graduates from local schools into the labour market as well as the contemporary trend of foreign graduates which try to enter the market. From 1987 a sharp increase in the number of dentists could be observed in Catalonia as well as in the rest of Spain. There was a 141% increase in the catalan dental workforce in the eighties (76 new dentist/year) and a 95% increase during the nineties (123 new dentists/year). Moreover, in the period 2000-2004 the average number of new dentists in the dental union (COEC) per year has surpassed the figure of 200 (226 exactly)(Figure 3).



**Figure 3. Evolution in the number of active dentists in Catalonia (1970-2004) plus period percentual growth**

This dramatic increase was first favoured by the fact that catalan students not accepted at catalan or spanish dental schools, due to a reduced fixed number of available posts, opted to study dentistry at foreign contries, mostly in Latinamerica, and returned home once graduated. The homologation of latinamerican degrees was, at that time, automatic and easy enough to have a “call effect” on latinamerican citizens, already graduated, which started to migrate to Spain. In 1980, only 3% of the dentists in Catalonia were graduated in a foreign country; in 2001 a 32% of dentists registered in Catalonia had a foreign diploma; in 2004 this figure achieved a 34,5%. Moreover, as Spain joined the EEC in 1986, the dental diploma changed from the medical based specialization (stomatology) to a new five-year long degree (odontology) to fulfil the requirements of the future free circulation of professionals within the EEC borders in 1992 and so to standardize the diploma according to the EEC dental regulations. This change also meant an increase in the number of students accepted (from an annual intake of about 40 students at the old school of Stomatology – funded in 1971- to a 114 students at the new public dental school of Odontology at the University of Barcelona -UB- which replaced it). So, in 1991, the first graduates in odontology from the University of Barcelona left the dental school. In 1996, a new private dental school opened at the International University of Catalonia (UIC) with an annual intake between 80 and 100 students, and therefore, in 2001 its first graduates started to enter the market.

Regarding the inhabitant/dentist ratio, we can observe that the evolution in the last thirty years shows an evident decrease (Table 1).

	1970	1980	1990	2000	2004
Inhabitants (thousands)	5.000	5.950	6.057	6.262	6.704
Dentists	324	541	1303	2537	3.444
Dentist' increase (total in the period/annually)	-	217(21,7)	762(76,2)	1234(123,4)	907(226,7)
Dentist' increase (%)	-	67%	141%	95%	35,7%
Female dentists (%)	-	108(20%)	299(23%)	890(35%)	1.497(43,5%)
Inhabitant/dentist Ratio	15.432	10.998	4.648	2.468	1.946

**Table 1. Evolution of the dentist/inhabitant ratio in Catalonia (1970-2004) plus other data.  
(Population in 2003 spanish census is used for the 2004 figure)**

Data regarding the evolution of the Spanish dental market (1987-97) were collected by Bravo<sup>6</sup> which found similar results for the whole Spain. While Spanish population grew a 2,5% during that period, the number of dentists grew a 136,1% (from 6.377 to 15.044) so the average number of dental visits per dentist decreased a 42%.

This trend is complemented with the existing demand to access the profession which still enjoys the social perception of an opportunity career. In fact, this subjective social perception is reinforced by some objective statistics. A survey developed by seven universities in Catalonia (2002), among its graduated students in the year 1998, about their insertion into the labour market shows some interesting data about dental graduates from the University of Barcelona (UB) compared to other graduates from the same university. The sample used in this study was very representative, according to its size, as the University of Barcelona managed to survey 6.105 graduates from a total universe of 9.220 (52 dental graduates were surveyed from an universe of 95)<sup>7</sup>. Data from the survey of active population in Catalonia, for the age range 25-54 (last trimester of 2001), showed that a 75,3% of them were occupied (working). Data from the survey among graduates at the UB showed a percentage of occupied graduates of 88,4% (which does not include a 3,6% of students which were following their studies). Data regarding dental graduates showed an occupation rate of 100%. On the other hand, while 21,13% of graduates at the UB worked for a public service only 3% of dental graduates did so, being this the smallest percentage among all graduates. Most of the dental graduates (77,08%) worked as "autonomous workers" not being under a salary based contract but working on their own (some of them working in their own dental practice and some others using this legal status to work for other colleagues or employers). This percentage is the highest one among all dental professions followed by Law graduates with a 28,68% while the average data for all UB graduates was 9,7%.

When asked about their opinion, dental graduates showed the highest mark among all graduates about repeating the same degree again with a 93,8%. On the other end, we could find Modern Philology graduates with only a 57,1% of students willing to repeat their degree. Dental graduates were also slightly more satisfied with their actual job than the rest of graduates, giving a mark of 5,6 while the average mark for all graduates from UB was 5,36/7. Only 4% of UB graduates were earning more than 30.000€ while data regarding dental graduates showed a figure four times higher (16%).

#### *PD Age*

The immigration of foreign diplomas in the last two decades represented a rejuvenation of the average age of dentists in Catalonia. The reason is that immigrants are usually young workers who accept the challenge of migration with the aim of improving their well-being by moving to places

---

6 Bravo M. Private dental visits per dentist in Spain from 1987 to 1997. An analysis from the Spanish national Health Interview Surveys. *Community Dent Oral Epidemiol* 2002 Oct;30(5):321-8.

7 Resultats de l'estudi d'inserció laboral dels graduats i les graduades universitaris realitzat per a l'Agència per a la Qualitat del Sistema Universitari a Catalunya. Resultats dels ensenyaments de la UB. Universitat de Barcelona, 2002. <http://www.ub.es/gtpe/PDF/insercio03.pdf>

where the reward of their labour would be higher than the one at home. This happens when the absolute levels of welfare at home are under a certain threshold, as it is happening in some latinamerican countries in the last two decades.

Furthermore, this rejuvenation was boosted by the introduction of the odontology degree in Spain. Taking into account that before 1986, to become a dentist in Catalonia, a diploma in medicine (six years' long) plus a specialization in stomatology was needed, meaning at least eight years of studies, and that the new degree in odontology was an independent diploma only five-year long, the age of new graduates is nowadays at least three years lower than it was twenty years ago. Moreover, the number of these graduates (usually 23 year-old) is nowadays higher (more than 200 new graduates per year) than before (around 40 just two decades ago) so the introduction of odontology had an important effect on the evolution of the average dentists' age which shows a light trend of rejuvenation (43 in 1980; 41 in 1990).

#### *PD Gender*

The incorporation of women into the dental profession is one of the most outstanding changes in the labour market and is a common trend to many other professions with a minor work availability, for reasons of pregnancy and of maternity. The evolution shows an increase from a 20% of female dentists in the profession, at the beginning of the eighties to a 36% in the year 2001 while the actual data shows that 43,5% of active dentists are female (2004). Lately, this incorporation has been more intense and according to the data of female students admitted to dental faculties (female students represented a 56% at UIC and 70% at UB of all students in 2001-02) there is an important trend towards an increase in this percentage. This increase is comparable to the evolution of women in medicine which in 1965 represented a 7,3% of the total of the profession, in 2001 this percentage already arrived to a 47,05% and the forecasts surpass a 60% in the year 2030<sup>8</sup>. The percentage of female dentists in several countries of our environment were, in a publication from 2000: Sweden 58%, Denmark 46 %, Portugal 40%, Spain 35,5%, Germany 35%, France 32%, United Kingdom 28% or Holland 19%<sup>9</sup>.

Some authors point out that this decided and important incorporation of women will entail relevant changes in the form of practicing dentistry, changes on the whole very positive. Women -like men- have their own psychology and way of acting, and in general the increase in the number of female dentists is associated with more prevention, more confidence and better communication with the patient and it is considered that their minor productive eagerness will provoke less overtreatment (female dentists tend to have fewer patients, and spend fewer hours working)<sup>10</sup>.

#### *PD Qualification*

---

<sup>8</sup> Demografía médica en España. Mirando al futuro. Confederación Estatal de Sindicatos Médicos. Madrid, 2004.

<sup>9</sup> Zillen PA, Mindak M. World Dental Demographics. Int Dent J, 2000; 50: 194-7.

<sup>10</sup> van Dam BA, van Rossum GM. Professional practice by female dentists in the Netherlands. Ned Tijdschr Tandhelkd 1998; 105(11):392-6.

When we analyze the qualifications and their evolution in Catalonia, we must highlight the change of qualifications from stomatology to odontology due to the opening of new odontological dental schools as well as for the immigration of foreign diplomas (mainly odontological). From being a 30% of the dentists in Catalonia in 1990, odontologists represent a 71% of all dentists in 2004. In Catalonia there is one public and one private dental school which graduate about 200 dentists (odontologists) per year. In the rest of Spain, in 2004, there were ten public dental schools plus other three which were private (Table 2) which will annually graduate a further 1.250 dentists (odontologists). At present the majority of dentists are odontologists and for biological reasons this percentage will be increasing rapidly. This fact probably could have positive consequences in the future for the organized profession consolidating its own identity, differentiated from the traditional medical field where it used to come from.

Traditionally, Catalonia has been a country capable of integrating new human resources in a very positive way, but such a sudden incorporation of foreign diplomas, coming from different training philosophies with diverse formative and competence goals, could constitute a problem. Establishing mechanisms, based on the acquisition of professional competences and less in the certification of theoretical knowledge would be necessary and very much needed in the future.

University	Students annual intake	Mark needed	Ranking dentistry / Rest of diplomas at Universitv	Opening of dental school	Status (Pub/Priv)
Barcelona	114	7.1	3/74	1986	Public
Complutense Madrid	110	7.57	3/140	1986	Public
Granada	90	7.75	5/119	1986	Public
Múrcia	40	7.98	2/57	1992	Public
Oviedo	45	8.06	3/83	2001	Public
País Vasco	53	7.35	5/128	1986	Public
Rev Juan Carlos	75	7.23	2/26	2002	Public
Salamanca	30	7.51	3/91	2001	Public
Santiago de Compostela	45	7.56	4/70	1986	Public
Sevilla	103	7.68	4/97	1989	Public
Valencia	75	7.83	4/89	1986	Public
Internacional de Cataluña	100			1996	Private
Alfonso X El Sabio	330			1994	Private
Europea de Madrid	182			1995	Private
Cardenal Herrera CEU	75			2002	Private

**Table 1. Evolution of Dental schools in Spain (2003-04)  
(1467 new students for the academic year 2003-04)**

### *PD Demographic projections*

There seems to be an absence of planning of dental human resources in a very clear way, justifying the opening of new dental schools with the fact that there is a potential demand from students that has not been reduced. In a country like USA, paradigm of a free market economy, the flow of students to dental schools follows some parameters related with economic changes (the number of graduates between 1983 and 1993 diminished in a 36% starting to increase from 1993 until today). Maybe the transparency and the capacity to transmit statistical data and information are explanatory of the mechanisms of response to changing situations in a fast and efficient way. The situation in Catalonia and Spain is quite different to the one in the USA. Although being a free market country, the government has a very important capacity of intervention with regulatory mechanisms regarding the training of human resources -Universities- as well as the provision of healthcare services – Catalan Health Service-, which as a matter of fact, mediatizes the formative process as well as the rendering of health services.

Taking into account the demographic growth of the profession in the nineties and foreseeing an average of drops in the poll of active dentists (1,5%) and a maintained demand from students to join dental studies and so a similar continuous trend of enrolment (186/year), in 2001 we carried out a simulation of human resources projection (Table 3).

YEAR	Catalan population	ENROLS		Dentists	Dentist/Inhabitants
	in thousands *	(constant)	DROPS (1,5 %)		Ratio
2001	6.216	186	44	2.723	1/2283
2002	6.249	186	44	2.865	1/2181
2003	6.285	186	46	3.005	1/2091
2004	6.323	186	48	3.143	1/2012
2005	6.362	186	50	3.279	1/1940
2006	6.401	186	49	3.416	1/1874
2007	6.440	186	51	3.551	1/1813
2008	6.478	186	53	3.684	1/1758
2009	6.515	186	55	3.815	1/1707
2010	6.551	186	57	3.944	1/1661
2020	6.862	186	75	5.135	1/1336

**Table 3. Future projections in the dentist/inhabitant ratio**

**\* Source: Catalan Institute of Statistics: central scenario**

It is necessary to differentiate two horizons (2010 and 2020) in this projection. The possibility of the observed figures standing in the projection ranges in the first horizon is much bigger than in the 2020 horizon. Unfortunately the projections did not fit with reality and the real population data on the first of January of 2004 had nearly achieved the expected population for 2020 (as planned by the national statistical institute –IDESCAT- in 2000) so increasing its number more than expected. The number of dentists has also grown at a very high rate (higher than our expectations) so even with the extraordinary inhabitants' increase, the ratio of dentists/inhabitants for 2004 has already reached the expected figures for 2005.

#### *PD Immigration flows*

The trends in the immigration flows are difficult to foresee, since they are influenced by sudden changes. The political and economic situation, severely deteriorated in many latinamerican countries, foresees a continued flow of dentists towards Spain. Catalonia, being a community with good level of development and quality of life is a potencial receiver of those dentists. As a matter of fact, the number of latinamerican graduates which try to homologate their degree in Catalonia is very high -300 in the year 2002- and this trend is maintained. This is a very serious subject and there is a need to urgently reform in depth the procedure used which is only based on theoretical exams and not on competencial skills. Moreover, the European Union free market has just increased its size and many new EU eastern countries could be a future source of new dentists.

#### **Productivity of professionals**

The provision of dental services is often associated to the number of professionals in exercise in one area. Even though the dentist/inhabitant ratio is an interesting raw figure for comparison, some variables affect it in a decisive way such as the productivity of dentists. Therefore the provision of services depends not only on the number of dentists, but also on their productivity level.

It is a demonstrated fact that increasing the healthcare offer provokes an increase in the demand for services, with some limits influenced among others by economic factors. The productivity of the dentists is influenced by very diverse factors related with the characteristics of the supplier, such as: age, gender, sanitary model (public versus private) or the type of practice (auxiliary staff and cabinets) among others.

The results of several studies about productivity differ according to the used methodology. In general they tend to measure technical efficiency regarding the dentist (costs/savings) rather than oral health goals achievement for the patient. The average dentist in Catalonia is a 36-45 year-old professional that works an average of 31-45 weekly hours (59%; 64,6% of men and 46,4 of women), working for his/her own (62,5%), in one or two dental practices (52% and 34%)<sup>11</sup>.

Applying a model proposed by the International Dental Federation (FDI), we can make the following estimations calculating the necessary time to give coverage to the needs detected, in a downward

---

<sup>11</sup> Presente y futuro socioeconómico del sector odontoestomatológico en Cataluña. Años 1996-2005. Col.legi Oficial d'Odontòlegs i Estomatòlegs de Catalunya. Barcelona: 1997.

calculation of demands for treatment. For the whole of the groups a total of 25,43 minutes would be required per person and year. With an average of 33 weekly hours worked per dentist the ideal ratio would be around one dentist for every 3.185 habitants.

### **Professional competences**

In all the dental educational system there is only one main evaluation. This is the admission control to enter the university related to the overall knowledge (which is very strict in public universities) but that is even before starting to learn any medical subject. Professional evaluation is afterwards absent apart from some subject exams, usually yearly, during the five-year studies. The continuous training as an educational process is the cycle of longer duration, and the one that probably has more practical consequences on work, but even though, it is the less regulated one. The continuous training is an individual responsibility in the first place, but also a responsibility of the organized profession as a goal to improve professional behaviour. Therefore, like any formative activity, it needs evaluation elements. It would be necessary, to favour a voluntarily process, so that the professionals could periodically prove their capacities -competences- like a mechanism of responsibility. A possible model would be that of the NBDE (Dental National Board of Examiners). This voluntary model has been pioneered with success in Catalonia - among general doctors-

The irruption of macropractices with dentists not working on their own, means a new form of practising dentistry where the values of an economic prevail over those of the traditional professional model based on confidence. The practice based on the optimization of productivity, often entails an increase of induced demand -overtreatment- and fractures the pact between patient and dentist based on confidence with negative and severe consequences for the profession as well as for the patients. The uncontrolled growth of dentists, might provoke an increase of the induced demand with dangerous consequences as the already studied medium life of a filling: "it diminishes when the income of the dentists diminish".

### **Other dental staff categories: auxiliaries and hygienists**

Both types of professionals (auxiliaries and hygienists) act as a support to the dentist' work and must always do it under his/her supervision. The tasks of hygienists are established by law while there is not such a legal frame for the figure of auxiliaries.

The dental practice model used before the eighties (individual own practice runned by one dentist helped by one or two auxiliaries) is changing by the increasing role of the newly introduced (1986) dental professional in the spanish dental labour market which is the dental hygienist. The profile of this professional is not just a helper of the dentist but a quasi-independant worker which, under the supervision of a dentist, can develop time-consuming treatments related to preventive dentistry (sealant's placement and fluoride treatments) and basic periodontal therapy, even though they are not allowed to apply local anesthesia. The increase in the number of theses professionals will have an important effect in the future as there eight different schools in Catalonia (3 public and 5 private) which annually graduate an approximate number of 240 hygienists. An estimation of the

number of hygienists working in Catalonia could be developed from two sources. The first one is the number of hygienists which gained their degree through a special examination for those working before the birth of the degree in 1986. This figure represents 1.086 professionals. The second figures comes from the numbers of hygienists trained from 1986 to 2004. There is no official figure for this share but estimations could easily represent a figure well above 1.500 further professionals making the number of hygienists in Catalonia achieve an approximate number of 2.500.

### 3.2 VARIABLES WHICH AFFECT THE DEMAND FOR ORAL HEALTH SERVICES

#### **Population demography**

The evolution of demography shows an ageing of the Catalan population due to a low fecundity ratio, each woman had 1,38 sons on average in 2003, plus an increasing life expectancy which was 80,18 years in 2002.

In general the different demographic studies give several reasons for explaining the causes of the low natural growth rate. There are aspects related with economy matters and a social delay of fecundity, like the case of late emancipation, which favours a low natality.

There are modifier elements like immigration, which is breaking all planned demografic scenarios, as we mentioned before. Dentistry must adapt to the progressive increase in the immigration flow, with a population with many acumulated needs of treatment which will surely have an impact on the patterns of distribution of oral diseases.

#### **Epidemiology of oral diseases**

Diseases like tooth decay, the treatment of which has been during many years the main occupation of the dentists, has had a very important slope in Catalonia. A brief critical analysis of the results of several epidemiological Catalan and Spanish oral health studies shows an important variation in the prevalence of oral diseases.

The epidemiological studies in Catalan child population demonstrate that children have experimented a very important decrease in dental tooth decay. Catalonia's DMFT (12 year-old) has decreased from 2,98 (1983) to 1,6 (1991) and then to 0,9 (1997). Moreover the distribution of the illness come off concentrated in a small group, considered at high risk, as 70,2% of 6 year-old children were caries free at the age of 6. Even though the restoration index has changed from 12% in 1983 to a 44,6% in 1997, this figure still means than only less than half of the caries lesions have been restored<sup>12</sup>.

Recently published oral health spanish data (2002)<sup>13</sup> showed that the DMFT (12 year-old) was slightly higher (1,12) than the catalan number but that the restoration index was also slightly higher (53%). A small 13% of the children accumulated half of the pathology.

---

<sup>12</sup> Casals E, Cuenca E, Prats R, Salleras L. Salud bucodental. Evaluación de los objetivos del Plan de Salud de Cataluña para el año 2000. Med Clin (Barc) 2003; 121 (Supl. 1): 64-8.

<sup>13</sup> Llodra JC, Bravo M Cortés FJ. Encuesta de salud oral de España (2000). RCOE 2002; 7 (núm.especial 3, monográfico): 19-63.

DMFT index in adults (35-44 year-old) is 8,4 (C.I. 95% 7,62-9,18), with a restoration index of 49%. In the group from 65 to 74 years the DMFT more than doubled this figure with a 18,10. Moreover, the missing component (lost teeth) of this index represented an 85,3%, so the habitual treatment of decay had been the extraction of teeth in too many cases, as only 6,5% of decayed teeth were restored. While the need for extractions was practically inexistent in children - 0,9 and 1,1% in 12 and 15 year-old, it increased to a 10,3% among young adults and even more than the double - 23% - in the elder group which stresses the lack of cultural knowledge regarding oral health and its importance.

In the year 2000 the preliminary results of an Spanish oral health survey among the population older than 64 were published. In this study, the percentage of complete edentate was 31%, with an average number of 10,4 teeth per individual. The percentage of individuals with severe dental losses (having less than 16 teeth) was 65,5%. A 25,2% of individuals needed, at least, an extraction of a tooth (data very similar to the survey mentioned before). The DMFT in this population was 21,5, accounting an important missed-teeth component of 18 (83,7% of decayed teeth). The sociocultural level, measured in years of education, had an important effect on the oral health of this population. Thus, there were less complete edentates, less tooth decay and better oral health higienic habits among (measured as brushing frequency plus consumption of toothpaste) among the elder with more years of study. Without any kind of doubt, it can be affirmed that the elder cohorts and the high risk groups should concentrate, in the future, all the efforts made to improve the oral health status, specially from the governamental institutions.

#### 4. EXPRESSED DEMAND FOR DENTAL SERVICES

The analysis of the needs for dental treatment in a population, and its translation into demand for dental services, is one of the most complex questions to solve. The evaluation of treatment needs is made through epidemiological surveys but it is necessary to take into account that the results for treatment needs of an epidemiological study are more conservative than the treatment needs obtained in a dental practice, due to the use of more conservative, objective and consistent diagnostic criteria. On the other hand, the process which turns treatment needs, detected by the experts, into treatment demand, expressed by patients, is complexe and influenced by different variables like availability, accessibility and acceptance. Moreover, it is conditioned by factors like: gender, educational and socioeconomic level, health knowledge or occupation. From a general point of view, attendance ratios among spanish citizens are among the lowest in Europe (Figure 2) and its continuous increase during the last 15 years is still very scarce (Table 4).

	YES	NO	Number of times of those attending	Months from last visit on those not attending last year
ENSE 1987	13,6	96,4	No Data	No Data
ENSE 1993	15	85	No Data	No Data
ENSE 1995	15.7	84.3	2.25	48.11
ENSE 1997	15.9	84.1	2.06	45.44
ENSE 2001	17,5	82,5	2,11	40,35

**Table 4. Evolution of spanish adults citizens (>16) which have visited a dentist or hygienist in the last three months (1987-2001) \* Source: Spanish National Health Survey**

When we analyse demand and utilization of oral health services it is necessary to take into account that these services do not follow habitual market laws, in which supplier and consumer have a similar information. In dental services, as well as in medical services in general, the information is asymmetrical (the supplier has much more information than the patient) so the supplier operates as an agent determining often the needs of the consumer and so influencing in a direct way on the demands for dental services. In this context, the situation of induced demand could be very frequent. The induced demand is above the demand which the patient would be willing to accept in the case that he had full information or at least the same information than the dentist. The analysis of the factors which are considered related with the practice of induced demand which can lead to overtreatment or unnecessary treatment are also complex. Most studies cite the increase in suppliers' offer -dentists- like one of the elements identified as responsible for overtreatment, in order to sustain the level of dentists' income in a competitive labour market. This situation might not have a negative impact if it stressed on non covered needs of the population, but often, this could entail overtreatment (treatment not needed and, therefore, iatrogenic) depending on the self-regulation of the profession and its ethical standards.

One of the key elements when analyzing the barriers that hamper or condition the process of translating the needs in oral health of the population into expressed demand for treatment is the type of funding. The expense in oral health, is a very important part in the sanitary expense. As a matter of fact, the average of dental expense in the twelve countries of the UE in 1992 was the 7% of the whole sanitary expense. In Catalonia, if we exclude surgical treatments, and some preventive activities in scholars all dental treatments are privately funded. In a study by Murillo (1983)<sup>14</sup>, about

<sup>14</sup> Murillo C, Calonge S. Distribució territorial de la despesa sanitària privada a Catalunya. Fulls economics del sistema sanitari. juliol/setembre; 1993:10-15.

the distribution of the private sanitary expense in Catalonia, the expense in dentistry for catalan families represented a share of the 28% of all their private sanitary expense.

According to the Spanish Health Surveys, the demand for dental services shows an important difference among genres at all ages. The spanish male population has an average odds ratio of 0.68, related to female, in relation to dental attendance.

Catalan citizens with higher education levels show a higher use of dental services (adults with universitarian studies have an odds ratio of 1.84 related to adults non alphabetized or without studies related to dental attendance) and a similar behaviour is followed by their children attendance (while 95% of children of parents in the lowest education group did not attend a dentist, this only happened in 65% of children whose parents had an universitarian degree). Even with this data available, it is difficult to relate educational level and dental attendance, as this variable could be directly related to another variable linked to the educational level as the income level. As a higher educational level is often related to a higher income level, those differents dental attendance' behaviours related to the educational level could have a real relation to income<sup>15</sup>.

Income level is the most determinant variable related to dental attendance (Table 5) and it has an effect at all income levels. Those citizens at the highest income group have a probability to visit a dentist in the last year seven times bigger than those in the lowest group. Even though those differences are not so important comparing each income subgroup, there is always a higher probability of visiting a dentist at a higher income group which only fails for the income group 8-9.

Income level	Probability of visiting a dentist during the last year compared to a income group under 1.500 €
Annual income range (€)	Odds ratio
1.500-2.999	3.629192
3.000-5.999	3.357284
6.000-8.999	3.707666
9000-11.999	4.023552
12.000-14.999	4.326792
15.000-17.999	4.608327
18.000-29.999	5.254401
30.000-41.999	6.409492
42.000-53.999	6.268629
54.000-65.999	6.998067
>66.000	7.466729
No answer	3.876589

**Table 4. Estimation of the effect of income level on the opportunity of visiting a dentist in the last year**

\*(Source: ESCAT 1994)

<sup>15</sup> López A, Planas I. Explotació estadística de la informació sobre patrons de consum dels serveis odontològics a l'Enquesta de Salut de Catalunya (ESCAT), la Encuesta Nacional de Salud (ENS) i la Encuesta Continua de Presupuestos Familiares (ECPF). Centre de Recerca en Economia i Salut. Universitat Pompeu Fabra, 2001.

From the study of the data from the Family Budgets Continuous Survey (1985 until 1995) to value the variables determining the family expense in dental services, the one that seemed clearly relates to higher expenses was the studies of the family head, according with the data from other surveys presented before. When this person had university studies the expense in dental services increased a 14% in respect to the expense of those families where the head of the family only followed primary education studies. The medium quarterly dental expense for a family has had very little variation during decade from 1985 to 1995, and euros represented in the year 2.000 about 480€. However this expense was strongly influenced by the expense of those families with the higher 10% expenses. Without those 10% "higher-expenses families" the average stand like this, about 210€ for every three months.

## 5. CONCLUSIONS

- The aim of dentistry is the improvement of oral health without any limits.
- Planning of dental human resources should be understood as one tool to attain the goals of oral health so the number and qualification of the dentists in Catalonia, must depend on established oral health goals. Demand to enter dental schools in Catalonia is very high and predictably will remain like this at least in the next years while the flow from foreign graduates (latinamerican graduates asking for homologation plus graduates immigrating from other EU countries) does not seem to decrease its high rate.
- According to the projections, based only on the resources formed in the catalan dental schools, plus vegetative demografic changes in the profession, the number of professionals in Catalonia in 2010, will approximately achieve the figure of 4.000. A surplus of dental professionals does not mean that the population would be correctly treated nor a better access to dental services. The amount of dentist nor the health expenditure are directly associated to better oral health levels.
- The practice based on economic productivity, often entails an increase of the induced demand - overtreatment - and a fracture in the pact between patient and dentist, based on confidence, with negative and severe consequences for the profession. The uncontrolled growth of dentists, might provoke an increase of the induced demand. Data show that even though there has been a strong increase in the number of dentist, dental attendance has only increased small percentage and the average expense has maintained its levels from 1985 to 1995.
- The incorporation of new technologies, even effectivity-tested, is associated with an increase of the cost of the practice of dentistry and, therefore, if no mechanisms to reduce the economic barriers are introduced, access to dental services will be even more difficult for a sector of our society.
- From all studied variables, studies from the family head and income level, are the determinants strongly associated with dental attendance. And among them, income level is the stronger one, being considered the strongest barrier for access to dental services.