

# Planning dental manpower in Lebanon: scenarios for the year 2015

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## تخطيط القوى العاملة في مجال طب الأسنان في لبنان لعام 2015

باسل دوغان، قاسم كصّك، دنيز بوجوا

**الخلاصة:** تم باستخدام النموذج التخطيطي الخاص بمنظمة الصحة العالمية والاتحاد الدولي لطب الأسنان، تقدير احتياجات لبنان من العاملين في مجال طب الأسنان. وكان الهدف هو مساعدة أصحاب القرار وراسمي السياسات في لبنان، على إجراء التخطيط الاستراتيجي لتوفير العاملين في مجال طب الأسنان، تمثيلاً مع ما هو وارد في الدلائل الإرشادية للخطة الوطنية لصحة الفم، التي هي قيد الاستخدام منذ عام 1995. وقد تم استخدام افتراضات مرتكزة على بحوث سابقة في مجتمعات منتقاة وذلك لدعم هذه المحاكاة. وكان قد تم تقدير عدد أطباء الأسنان الذين يحتاجهم لبنان في العام 2015 بـ 2715 طبيباً، بينما يقدر العدد المتوقع وجوده بـ 6176 طبيباً. ولذلك تَمَسُّ الحاجة إلى اتّخاذ تدابير عاجلة، لخفض الفائض المحتمل في عدد أطباء الأسنان في هذا البلد.

**ABSTRACT** The requirements for dentists in Lebanon for the year 2015 were estimated using the World Health Organization/World Dental Federation planning model. The aim was to help decision- and policy-makers in Lebanon to plan strategically for the supply of dental personnel in line with the recommendations of the Oral Health National Plan guidelines from 1995. Assumptions based on previous research in selected populations were taken to support the simulation. The number of dentists required for Lebanon in the year 2015 was estimated to be 2715 while the projected supply will be 6176. Urgent measures are needed to reduce the potential oversupply of dentists in this country.

### Planifier le personnel dentaire au Liban : scénarios pour l'an 2015

**RÉSUMÉ** On a estimé les besoins en dentistes au Liban pour l'année 2015 au moyen du modèle de planification mis au point par l'Organisation mondiale de la Santé/la Fédération dentaire internationale. L'objectif était d'aider les décideurs et responsables de l'élaboration des politiques au Liban dans la planification stratégique des effectifs dentaires conformément aux recommandations figurant dans les directives du Plan national de santé bucco-dentaire de 1995. Des hypothèses basées sur des travaux de recherche antérieurs dans certaines populations ont été utilisées pour obtenir cette simulation. On a estimé à 2715 le nombre de dentistes dont le Liban aura besoin en l'an 2015 tandis que les projections des effectifs dentaires sont de 6176. Des mesures urgentes sont nécessaires pour réduire l'excédent potentiel de dentistes dans le pays.

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Received: 31/03/03; accepted: 01/06/04

## Introduction

Despite the complexity of planning human resources for dental services, it is essential for a nation to adjust for the future supply of dental personnel and services [1]. Several industrialized countries have documented their experiences of dental planning, projections, forecasting and evaluating dental human resources during the past 2 decades [2]. The oversupply and the underemployment of dentists have been reported in many American and Scandinavian studies [3–5]. However, the topic has gained attention in only a few countries of the Eastern Mediterranean Region [6]. In 1988, the World Health Organization (WHO) and the Federation Dentaire Internationale (FDI) set guidelines as a model for the planning and monitoring of oral health services and care [7]. The model was intended to assist in the prediction of dental workforce requirements using a needs-based, demand-weighted assessment method.

In Lebanon, the number of dentists is increasing steadily. The dentist to population ratio was 1:1000 in 1994 and was described as being the highest in the Eastern Mediterranean Region [8]. Currently, it is estimated that there are 4111 dentists registered in the 2 Lebanese dental associations of Beirut and North Lebanon [9].

The purpose of this study was to estimate the need for dentists in Lebanon for the year 2015 using the WHO/FDI model. This would help decision- and policy-makers in Lebanon to plan strategically for the supply of dental personnel in line with the recommendations of the Oral Health National Plan that was drawn up in 1995 after the National Workshop for Development of National Strategies on Oral Health [unpublished report].

## Methods

Data were collected on the dental needs of the Lebanese population, demand for dental services in the population and the annual working time of a dental practitioner. The data for dental needs and demands were derived from 2 main surveys: the national oral health survey implemented in 1994 [8] and the oral health survey among 35–44-year-old adults [10]. The data for the estimates of annual working time were derived from a survey of dentists carried out in 1997 [11].

### Assumptions: definitions and justifications

In order to forecast the future needs of dentists in Lebanon, different scenarios were tested based on the following factors:

- The oral health status of the population to be achieved according to specific objectives.
- The percentage of the population to be covered by dental services.
- The annual working time of dentists.
- The period of replacement of dental restorations and prostheses.

### Oral health status

Estimates of the future oral health status of the population was based on the following assumptions:

- Caries treatment: stable situation. The Lebanese national oral health survey performed in 1994 showed that the mean decayed, missing and filled teeth (DMFT) index at 12 years of age was 5.7, the highest in the Eastern Mediterranean Region [8]. In the absence of any preventive strategy, it can be assumed that the DMFT index for all ages would not vary in the years following the study.

- Caries treatment: improved situation. An alternative assumption was an improvement in the oral health of the Lebanese population, with a corresponding fall in the DMFT indices. DMFT values of the National Oral Health Plan objectives for the year 2015 estimated a DMFT of 2.0 at 12 years of age [unpublished report]. In the absence of data on the DMFT index for the 30–64-year-old cohort, values were estimated by extrapolating the theoretical curve for each level [12].
- Prostheses calculation. It is important to estimate the future needs of the population for dental prostheses. If there is an improvement in the oral health status of the population in the coming years, we can assume there will be a decrease in prosthetic needs. However, this decrease is expected to be minimal, because the high DMFT index at age 12 years means that prosthetic needs will remain important despite an improvement in the oral health of the population.

#### Percentage of the population to be covered by dental services

Although the norms for the percentage of the population requiring dental treatment are difficult to verify, we applied the figures from the WHO/FDI methodology for

developing countries [7]. Table 1 shows the results of 3 different scenarios of patient demand (maximal, intermediate and minimal).

#### Annual working time of dentists

Data derived from a dentists' survey in 1997 show that the annual working time of Lebanese dentists is on average 1050 hours a year [11]. Two scenarios were applied (a 20% underestimation and a 20% overestimation) resulting in a rough estimate of annual working times of 900 and 1200 hours respectively.

#### Period of replacement of dental restorations and prostheses

The criteria for calculating the period of replacement of dental restorations and prostheses was based on information from the literature. We assumed that the period of replacement of restorations and prosthetics could vary between 10 and 20 years.

### Results

Tables 2 and 3 show the dentist to population ratio and minutes of treatment required according to different scenarios of patient demand, annual working hours and restorations and prostheses replacement periods.

Table 1 Percentage of patient demand per age cohort estimated according to different scenarios

Age cohort	Patient demand scenario		
	Maximal demand (% of patients)	Intermediate demand (% of patients)	Minimal demand (% of patients)
0–14 years	100	90	80
15–29 years	85	75	65
30–64 years	65	50	35
65–79 years	30	20	10

**Table 2 Stable oral health situation: dentist to population ratio and minutes of treatment required according to different scenarios of patient demand, working hours and prosthesis replacement periods**

Patient demand and dentist working hours/year	Restoration and prosthesis replacement period					
	10 years		15 years		20 years	
	Time required (min./ person)	Ratio (dentists: population)	Time required (min./ person)	Ratio (dentists: population)	Time required (min./ person)	Ratio (dentists: population)
<i>Maximal demand</i>						
900 h/yr	46.4	1:1164	42.3	1:1277	40.0	1:1350
1050 h/yr	46.4	1:1358	42.3	1:1489	40.0	1:1575
1200 h/yr	46.4	1:1552	42.3	1:1702	40.0	1:1800
<i>Intermediate demand</i>						
900 h/yr	39.5	1:1367	36.0	1:1500	34.2	1:1579
1050 h/yr	39.5	1:1595	36.0	1:1750	34.2	1:1842
1200 h/yr	39.5	1:1823	36.0	1:2000	34.2	1:2105
<i>Minimal demand</i>						
900 h/yr	32.7	1:1651	29.8	1:1812	28.4	1:1901
1050 h/yr	32.7	1:1927	29.8	1:2114	28.4	1:2218
1200 h/yr	32.7	1:2202	29.8	1:2416	28.4	1:2535

**Table 3 National plan 2015 objectives: dentist to population ratio and minutes of treatment required according to different scenarios of patient demand, working hours and prosthesis replacement periods**

Patient demand and dentist working hours/year	Restoration and prosthesis replacement period					
	10 years		15 years		20 years	
	Time required (min./ person)	Ratio (dentists: population)	Time required (min./ person)	Ratio (dentists: population)	Time required (min./ person)	Ratio (dentists: population)
<i>Maximal demand</i>						
900 h/yr	34.9	1:1547	34.8	1:1552	34.5	1:1565
1050 h/yr	34.9	1:1805	34.8	1:1810	34.5	1:1826
1200 h/yr	34.9	1:2063	34.8	1:2069	34.5	1:2087
<i>Intermediate demand</i>						
900 h/yr	30.6	1:1765	29.9	1:1806	29.6	1:1824
1050 h/yr	30.6	1:2059	29.9	1:2107	29.6	1:2128
1200 h/yr	30.6	1:2353	29.9	1:2408	29.6	1:2432
<i>Minimal demand</i>						
900 h/yr	25.4	1:2126	24.9	1:2169	24.7	1:2186
1050 h/yr	25.4	1:2480	24.9	1:2530	24.7	1:2551
1200 h/yr	25.4	1:2835	24.9	1:2892	24.7	1:2915

The results of the stable oral health situation are presented in Table 2. The values of the dentist to population ratio vary between 1:1164 (for a maximal demand and a period of restoration replacement of 10 years) and 1:2535 (for a minimal demand and a replacement period of 20 years).

The results of an improved oral health situation according to the Lebanese national plan for 2015 are presented in Table 3. Assuming that restorations and fillings should be changed every 10 years, the results show that the annual working time per dentist is 34.9 minutes for a maximal demand (100% of dental coverage for the 0–14 years), and an estimated dentist to population ratio of 1:1805 when using the average dentists' working time. An under- or overestimation of the dentists' working time will lead to a dentist to population ratio of 1:1547 and 1:2063 respectively.

According to the Central Administration for Statistics [13], the Lebanese population has an annual growth rate of 1.65%. The projected population will therefore be 4.2 million by the year 2015. Based on this projection, and the previous determinants

of workforce requirements, the estimated dentist to population ratio obtained using the WHO/FDI model is 1:1547, yielding a need for 2715 dentists.

### Projection of the number of dentists

In the absence of any health strategy, we can assume that the behaviour of dentists within their profession will not change. This situation is known as *status quo* where the same patterns of inflow and outflow of dentists will be observed. The annual number of new dentists entering the market will be equal to the number of new graduates from national and foreign universities minus the number of dentists leaving the profession because of retirement, death or immigration. This number can be calculated graphically using a linear regression of the evolution of the number of dentists during the last 20 years (Figure 1). The results of this forecast show that the number of dentists by year 2015 will be 6176, assuming the stability of patterns observed, and hence an oversupply of more than 3400 dentists, with a dentist to population ratio of 1:680.

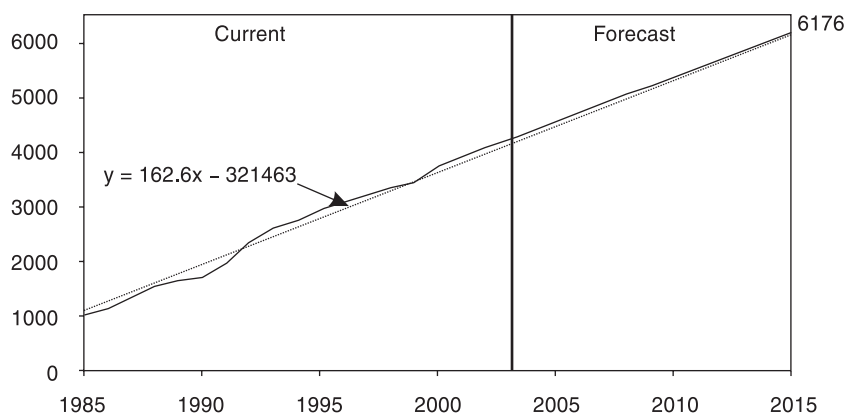


Figure 1 Forecast of the number of dentists in Lebanon by year 2015 in the “status quo” scenario

### Impact of reducing the number of new graduates

Figure 2 shows the impact of reducing the number of new graduates on the overall number of dentists. A 25% and a 50% reduction in the number of new graduates from national and foreign universities will lower the number of dentists to 5689 and 5197 respectively.

### Discussion

Data analysis showed that the highest dentist to population ratio (1:1164) was obtained when applying the scenario of a stable oral health situation and a high demand for care. This ratio decreased to 1:1547 in the scenario based on the 2015 national plan. The improvement in the oral health of the population will lead to a reduced need for dental personnel.

The results showed a positive impact of the annual dentists' working time on the dentist to population ratio. Assuming that the period of replacement for dental restorations and prostheses is constant, an increase in the annual working time of den-

tists will lead to a reduction in the number of dentists required to serve the community. It is therefore important when planning dental manpower to take into account socioeconomic factors that can modify the behaviour and practice of dentistry. These factors include an increase in the number of female dentists [5], a restriction in the number of new graduates (*numerus clausus*), changes in taxes, changes in the administration of dental clinics and changes in the lifestyle of citizens [14].

Furthermore, the period of replacement for restorations and prostheses is an important factor in the planning of dental manpower. Assuming that this period varies between 10 to 20 years, the activity of dentists will decrease 14% in the case of a stable situation scenario. The quality of care plays a key role in the determination of the replacement period. Restorations of high quality will last longer than restorations of lower quality. Changes would be observed in the near future not only because of improvements in dental materials and research, improved training of future dentists but also because of the willingness of the

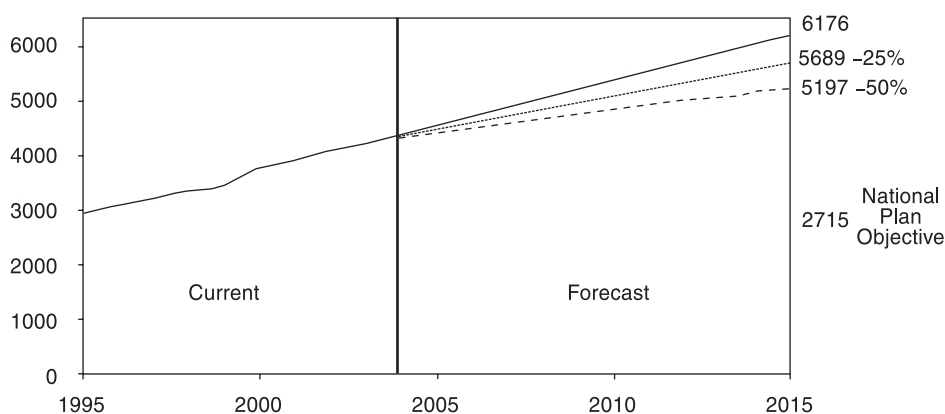


Figure 2 Impact of reducing the number of new dental graduates on the supply of dentists in Lebanon

dental profession to reinforce preventive policies leading to longer lasting restorations [14].

Another factor that should be taken into consideration in dental manpower planning is the percentage of the population to be covered by dental care. Full coverage of children aged 0–14 years is mandatory for the improvement of the oral health of the population. Demand for dental services of 85%, 65% and 30% for the age cohorts 15–29, 30–64 and 65–79 years respectively is considered to be maximal demand and an objective to be reached. These percentages are recommended by WHO and FDI for developing countries [7].

Our results showed that dentists' activity varies according to the percentage of the population covered by dental care. In the stable oral health scenario, dentists' activity dropped 30% when the demand moved from the maximal to the minimal level (from 46.4 to 32.7 minutes/person).

According to the data derived from the Lebanese Dental Association, 4111 dentists are registered in Lebanon. The number of dentists has increased considerably during the last 20 years, by 2.5 between 1980 and 1990 and has doubled between 1990 and 1999. The current average dentist to population ratio is 1:800, which is the highest in the Eastern Mediterranean Region [8]. In addition, a severe maldistribution of dental manpower is observed in the country. This ratio reaches 1:387 and 1:459 in Beirut, the capital, and Mount Lebanon respectively. On the other hand, the dentist population is young, with half of them aged between 32 and 46 years.

It is imperative to try to solve this growing problem. The current dentist to population ratio is far different from the desired ratio obtained with the WHO/FDI model. Lebanon is facing a major oversupply of

dentists. The highest dentist to population ratio obtained using the model was 1:1164 in the most unfavourable situation, i.e. assuming a stable oral health status, a 10-year period of restoration replacement, a maximal demand and an under-estimation of dentist working time. If no action is taken to solve this problem, the number of dentists in the year 2015 will rise by 70% and the number of dentists will be approximately 6176, with a dentist to population ratio of 1:680. If Lebanon adopts a national oral health strategy according to the national plan for 2015, the need for dental personnel will be lower still. According to the model, the highest dentist to population ratio needed is 1:1547, when applying the hypothesis of maximal demand, the minimum annual working hours per dentist and a minimum period of restoration replacement. When adopting the graphical projection, the number of dentists needed was 2715 according to the national plan objectives for year 2015.

Although some may believe that an oversupply of dentists may benefit the public by delivering better services at lower prices in a free market [15], the imbalance in dental manpower can lead to undesirable consequences at the professional, economic, health and social levels [16]. Dentist oversupply may adversely affect conditions of practice and patterns of work. Dentists may experience unemployment, underemployment or reduced opportunities for employment. Dentists can experience a drop in their real income. There may be increasing competition between professionals. There may be a deterioration in the quality of care. There could even be a threat to ethical principles, for example if there is a temptation to over-treat patients, introduce unnecessary services or fail to refer when indicated [16].

The imbalance in dental manpower seems to be an international issue. The oversupply of dentists has been a major concern in various industrialized countries for the last decade and several studies on dental manpower planning have been published. Lewis reported that the shortage of dentists increased from 32% in 1978 to 46% in 1984 in Canada [17]. Dental schools in North America reduced class sizes due to a perceived oversupply of dentists [18]. The oversupply of dentists in America has been described in many publications [2–4]. Beagrie reported that Scandinavian countries have also reported severe underemployment and unemployment problems for dentists with a dentist to population ratio lower than 1:1000 [5]. However, and in contrast to developing countries, oral health in these countries has improved considerably (and dental caries decreased) during the previous decades.

Some ideas to solve this problem have been suggested in the literature. Restricting the number of undergraduate students has been implemented in many countries [3,5,18,19]. This solution might prove to be insufficient in Lebanon, if it is not coupled with other measures. Projections showed that a 25% and a 50% reduction in the number of undergraduates will lead to a reduction of 8% and 16% in the number of dentists respectively in 2015. The dentist to population ratio will become 1:743 and 1:813 respectively. The oversupply can be

controlled by reducing the inflow of graduates of foreign dental schools [20].

Mann et al. cited a number of solutions that can help solve the problem of oversupply [15]. Increasing demand for services might be the most convenient and reasonable approach. Financing dental services or the presence of a third party payment is an additional approach to increase demand on services. An improved geographical distribution of dentists might be considered as a short-term solution.

Because of the long training time of dentists and because repercussions of a decision arise 6 to 10 years after it has been taken, measures should be taken urgently in order to reduce the supply of dentists [21].

## Conclusion

Given the situational analysis on the utilization of dental services and the current oral health status in Lebanon, a theoretical assessment of the need for oral health providers has been presented. Using the WHO/FDI planning model, it is believed that the country is facing an oversupply of dental human resources. As such, this calls for an urgent need to monitor closely the supply and demand for dental services. The establishment of such a monitoring and evaluation system should help the decision-makers in better formulating appropriate policies and strategies to improve the oral health of the Lebanese population.

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