

# Applicability of the Moyers prediction tables at 75% on Mapuche-Huilliche patients, Chile

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## Abstract

**Objective.** To determine the applicability of the Moyers prediction tables at 75% on patients from the Mapuche-Huilliche population, Chile. **Materials and Methods.** A descriptive, observational study which evaluated the Moyers prediction tables at 75% in a Mapuche-Huilliche population aged between 11 and 17(25 men and 25 women). The sum of the lower incisors, and the sum of the canines and premolars of each quadrant was compared with each of the predictive values. **Results.** Increased number of cases in the range from 23.5 mm to 25.2 mm in the sum of lower incisors, which represent 60% of the sample. The sum of canines and premolars showed in maxilla a mean of 23.7 mm in men and 23.1 mm in women, and in mandible a mean of 22.9 mm in men and 22.1 mm in women. A negative discrepancy of 60% was found in men and of 40% in women. For women, the positive discrepancy significantly exceeded the negative discrepancies with percentages of 88% and 8%. **Conclusions.** The Moyers method at 75% was applicable in maxilla and mandible on Huilliche men, and partially applicable on women of the same ethnic group.

**Keywords:** Mapuches, Mixed dentition analysis, incisor, Moyers prediction tables..

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## Introduction

The analysis of mixed dentition is a key element of orthodontic evaluation: it helps to determine the space available for permanent teeth, and it is also necessary to take decisions in relation to eruption, serial extractions, space maintenance or recovery, among other things (1–4).

It is argued that the Moyers prediction tables are the most widely used method to predict the size of permanent canines and premolars according to their correlation with the mesio-distal width of lower permanent incisors (5–7). This is the case because the systematic error is usually minimal, it can be used by beginners and experts with the same level of reliability, it does not require a complex clinical opinion and it saves time. It requires no specific equipment or radiographic projections; it can be used in both arches and, although it is better to apply it on dental models, it can be used in mouth with reasonable precision (3). Although the Moyers prediction tables have advantages, they were developed in a Caucasian population. The application of this method to other ethnic populations has been studied and also questioned on several occasions (6–9).

The population of Latin America is basically a mixture of European and indigenous people. Thus, diverse groups live all around the continent with the anatomic characteristics of each ethnic group (10).

According to the 2002 Census of Chile, 604,349 people in Chile stated that they belonged to the Mapuche population, approximately 4% of the total population, and 87.3% of the total indigenous population. They live mainly in the Araucania Region (33.6%) and in the Metropolitan Region (30.3%), and in smaller numbers in the regions of Biobío (8.8%), Los Lagos and Los Ríos (16.7% for the two together). The Region of Los Lagos is

the third region of the country regarding the number of members of the ethnic group. It has a total of 100,327 individuals, which accounts for 16.6% of the total Mapuche population. Out of these, 2,121 individuals live in the commune of San Pablo, which amounts to 21% of the total population there (11, 12). The aim of this study is to determine the applicability of the Moyers prediction tables at the 75 percentile confidence level on the Mapuche-Huilliche population of the rural/coastal area of the Commune of San Pablo, Province of Osorno, 10th Region, Chile.

## Materials and methods

This is a descriptive observational study whose universe is the indigenous Mapuche-Huilliche population of the coastal area of the Commune of San Pablo, Osorno, Chile.

We had a convenience sample of 50 patients (25 men and 25 women) aged between 11 and 17, who complied with the following criteria for inclusion:

- At least one of their surnames was of indigenous origin (13, 14)
- A complete set of permanent teeth from the first molar to its contralateral tooth in both maxilla and mandible
- No proximal restorations and/or interdental caries
- Residence and place of studies in the coastal area of the commune
- The criteria for exclusion were the following:
  - Foreign surnames
  - Dental anomalies of size, number and shape
  - Previous orthodontic treatment
  - Craniomandibular dysfunctions, fractures and/or attritions
  - Syndromes

Parents and/or guardians were asked to sign a

consent form so that their children could be included in the study. Additionally, the consent of the participants was requested before records were taken.

Casts of the maxilla and the mandible were taken using Jeltrate Orthodontic Chromatic (Dentsply) fast-set alginate and Jeltrate pre-shaped stainless steel metallic trays. To reduce possible distortions of the impression material when making the study models, the trays were emptied using stone cast immediately after the impressions had been taken. The greatest mesio-distal width of the 4 mandibular incisors and of canines and premolars of both arches were measured independently using a Dentaurem dental vernier analog caliper with fine tips (0.1 mm). Three alternate measurements were taken by the same professional in relation to the other teeth of the arch under study. The modal value was set as the final value, and the dental caliper was kept perpendicular to the long axis of the tooth crown and parallel to the buccal and occlusal surfaces. The procedure was conducted with natural light from a source located opposite the professional and within the same physical space. The predictive analysis was conducted using the Moyers prediction tables at the 75 percentile confidence level. The differences between the real dimensions and the predictive value for the sum of the mesio-distal diameters of canines and premolars in each quadrant were determined. The following values were calculated: mean, range, discrepancy between real values and predictive values, and standard deviation. The real values of the sum of mesio-distal diameters of canines and premolars were compared with the predictive values of the Moyers tables at 75%.

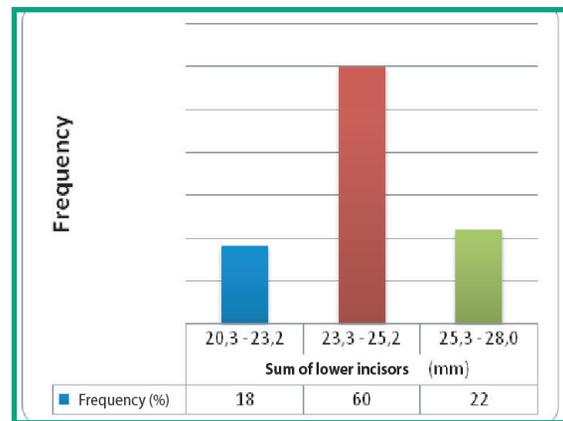
When Student's t-distribution was applied to verify the differences between the predictive measurements of Moyers 75% and the real values observed, the following values were obtained: in men, a value  $p=0.667$  in maxilla

and  $p=0.474$  in mandible (without statistical significance); and in women,  $p=0.191$  in maxilla (without statistical significance), and  $p=0.000$  in mandible, where the difference was statistically significant.

## Results

Most values of the total sum of lower incisors fall within the 23.5 mm to 25.2 mm range, which represent 60% of the sample under study (Fig.1).

Fig. 1 Frequency of sum of lower incisors values for Mapuche-Huilliche men and women, Commune of San Pablo, 10th Region.



The sum of canines and premolars showed in maxilla a mean of 23.7 mm in men and 23.1 mm in women, and in mandible a mean of 22.9 mm in men and 22.1 mm in women.

As for the discrepancy between the real value of the sum of permanent canines and premolars and the probability predicted with the Moyers tables at 75%, there was an overestimation of 58% of the necessary space, that is to say, the sample studied presented smaller dental sizes than the estimation made following the Moyers analysis at 75%.

Upon comparing both arches, the mandible was found to have a higher frequency of overestimation (68%), whereas in maxilla the discrepancy percentage was more even. When real and predictive values were compared

in maxilla in both sexes, a negative discrepancy of 60% was found in men and of 40% in women. The distribution in mandible for men was similar regarding positive and negative discrepancies, unlike in women, where

positive discrepancies significantly exceeded negative discrepancies with percentages of 88% and 8% respectively (Tables I and II).

**Table I.** Frequency of discrepancies between real and predictive values according to Moyers 75% in maxilla for Mapuche-Huilliche men and women, Commune of San Pablo

	POSITIVE DISCREPANCY		NEGATIVE DISCREPANCY		NO DISCREPANCY		TOTAL	
	N	%	N	%	N	%	N	%
MEN	10	40	15	60	0	0	25	100
WOMEN	14	56	10	40	1	4	25	100

**Table II.** Frequency of discrepancies between real and predictive values according to Moyers 75% in mandible for Mapuche-Huilliche men and women, Commune of San Pablo

	DISCREPANCIA POSITIVA		DISCREPANCIA NEGATIVA		SIN DISCREPANCIA		TOTAL	
	N	%	N	%	N	%	N	%
HOMBRES	12	48	12	48	1	4	25	100
MUJERES	22	88	2	8	1	4	25	100

In maxilla, the greatest differences between real and predictive values were observed in the ranges of 1.00 mm to 0.4 mm in men (72%) and of 0.5 mm to 0.9 mm in women (64%). In mandible, the greatest differences between both values were observed in the ranges of 1.00 mm to 0.9 mm in men (76%) and of 0.00 mm to 1.4 mm in women (76%).

## Discussion

Many international studies show different degrees of applicability of the Moyers prediction tables developed in a population of Caucasian children of Northern European descent (4) whose bone and dental morphological

characteristics differ greatly from those of the population of this study. A study from Saudi Arabia shows an overestimation of the size needed (6) and a study conducted in South Africa (15) on a black population shows an underestimation of the space needed. There are also significant differences between real values and Moyers predictive values in Kenya (16). The variable results of several international studies show that the extent of applicability of the method varies in different ethnic groups (17). Therefore, it is suggested that these predictive tables should be previously validated in a specific population to ensure their clinical applicability (18–22). The criteria for inclusion in this study do not include variables such as real crowding, a history of

tooth decay and loss of space in mixed and temporary dentition. Perhaps they should be considered in further studies to minimize bias.

The high number of individuals of the Mapuche ethnic group within the population that attends health centers in the country entails an obligation for health professionals: they must know the extent to which Western medical analysis and diagnostic methods are reliable and applicable (11) .

In Chile, models of patients over 12 from Concepción and Antofagasta have been studied. The clinical and statistical validity of the Moyers prediction tables at 75% was established in both populations. The Moyers analysis is reliable in both sexes and has a higher correlation in mandible (23). The results of this study differ from other findings in Chile, as we have observed a higher correlation in maxilla and in both sexes, and a significant overestimation in

## Conclusions

The Moyers prediction tables are applicable in maxilla for all the cases of this study. However, in mandible they are not applicable on women given the significant overestimation for canines and premolars according to the Moyers prediction tables at 75%.

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