



## Changes in stature, weight, and nutritional status with tourism-based economic development in the Yucatan

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### ABSTRACT

Over the past 40 years, tourism-based economic development has transformed social and economic conditions in the Yucatan Peninsula, Mexico. We address how these changes have influenced anthropometric indicators of growth and nutritional status in Yalcoba, a Mayan farming community involved in the circular migration of labor in the tourist economy. Data are presented on stature and weight for children measured in 1938 in the Yucatan Peninsula and from 1987 to 1998 in the Mayan community of Yalcoba. In addition, stature, weight and BMI are presented for adults in Yalcoba based on clinic records. Childhood stature varied little between 1938 and 1987. Between 1987 and 1998 average male child statures increased by 2.6 cm and female child statures increased by 2.7 cm. Yet, 65% of children were short for their ages. Between 1987 and 1998, average child weight increased by 1.8 kg. Child BMIs were similar to US reference values and 13% were considered to be above average for weight. Forty percent of adult males and 64% of females were overweight or obese. The anthropometric data from Yalcoba suggest a pattern of stunted children growing into overweight adults. This pattern is found elsewhere in the Yucatan and in much of the developing world where populations have experienced a nutrition transition toward western diets and reduced physical activity levels.

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### 1. Introduction

Throughout Latin America and much of the developing world, nations are turning to tourism as a path to economic development for generating much needed foreign income and investment. International tourism to Central America expanded dramatically between 1987 and 1991, with growth rates of 11.5% and 16.8%, respectively (Stonich, 1998). Mexico is a leader in Latin American tourism and the Yucatan Peninsula is one of the most important tourism destinations in Mexico. For example, Cancun, the center of tourism-based development, grew from a small fishing village of about 400 inhabitants in the early 1970s

to a population of over 400,000 people in the 1990s (Daltabuit and Leatherman, 1998; Pi-Sunyer and Thomas, 1997). Mayan communities have become directly involved in the tourist economy as a source of inexpensive labor for construction and service jobs at tourism centers and as sites of ecotourism and archaeotourism. These changes in regional and local economies have affected the diet, nutrition and health of Mayan populations.

Populations in Mexico, Latin America and much of the world are experiencing a nutrition transition toward western diets and activity patterns associated with an increase in obesity and chronic diseases (Rivera et al., 2004; Popkin, 1998). This nutritional pattern is often manifested in patterns of stunting or low height-for-age values, coupled with obesity in the same population (Popkin et al., 1996). Changes in heights and weights of children and adults in the Yucatan are investigated to

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assess whether similar evidence of a nutritional transition exists in rural Mayan communities experiencing tourism-led economic changes. This analysis focuses on the community of Yalcoba in the maize producing region of the peninsula between the late 1980s and late 1990s, where we have collected anthropometric data and information on changing economic activities, food systems and diet.

## 2. Background

The development of a tourist economy in the Yucatan Peninsula relied on labor from its interior and in the late 1960s and early 1970s the Mexican federal government made public investments in infrastructure, health care and food distribution networks to facilitate an adequate supply of labor to the cities of Merida and Cancun (Gurri et al., 2001). Universal health coverage against diphtheria, whooping cough, tetanus, polio and measles were initiated for infants and children under 5 years old and government run clinics were expanded to provide basic health care for the larger population (Gurri, 1997). Today, Mayan communities are enmeshed in the broader tourism-based economy as construction workers, tour guides and artisans, as well as waiters, maids and gardeners in tourist resorts. The region's subsistence economy has transformed into a mixed economy of wage work (Re Cruz, 1996) coupled with slash and burn milpa agriculture producing corn, beans and squash, and use of important forest resources (Primack et al., 1998).

With the growth of the tourist economy, households and communities in the Yucatan have become increasingly dependent on the large urban centers for income (Daltabuit and Pi-Sunyer, 1990; Kintz, 1980) and we have observed that the reliance on milpa agriculture and home-gardens has declined (Daltabuit and Leatherman, 1998; Leatherman and Goodman, 2005). This increased reliance on non-local foods is exacerbated by communally owned lands in Yalcoba, the ejido, that are limited in size and overworked, reflected in decreased productivity. Few families grow enough corn to last a year and more foods of all sorts must be purchased, especially during summer months.

As household production declined and the role of markets increased, Yalcoba residents increasingly consumed foods produced out of the area, an example of dietary delocalization (Pelto and Pelto, 1983; Leatherman and Goodman, 2005). By the mid-1980s, there was a shift from locally produced food toward commercial foodstuffs, where sodas and snack foods became key elements (Daltabuit, 1988). Current diets illustrate a trend toward increased consumption of high-calorie, low-nutrient snack foods (Leatherman and Goodman, 2005). Mexico rivals the US as the highest per capita consumer of soft drinks in the world (Coca-Cola Company, 1999) and rural residents consume an average of one soda per day. Many school children likely obtain 20% or more of their daily caloric intake from sodas and other high-calorie snack foods (Leatherman and Goodman, 2005).

Although shifts from locally produced to commercialized foods are associated with increased dietary diversity

and improved levels of nutrition in industrialized nations, such shifts often have a negative impact on nutrition in poorer countries, communities and families who cannot afford to purchase a variety of foods at market prices (Pelto and Pelto, 1983). Decreased subsistence production combined with an inability to purchase market foods reduces dietary diversity and nutrient intakes (Dewey, 1989). Despite adequate caloric intake, several micronutrients (e.g., Vitamins A, B2, B12 and zinc) and protein quality are notably lacking in Yalcoba diets, especially among households without steady sources of cash income (Leatherman and Goodman, 2005).

## 3. Methods

In order to assess the effects of social and economic change on nutrition and health, height and weight data from three time periods are presented. The three data sets include stature of 215 children from 1938 reported by Steggerda (1941), stature and weight data from 288 school children in Yalcoba from 1987 (Daltabuit, 1988) and new stature and weight data from a sample of 470 Yalcoba school children in 1998. The newly reported data from 1998 were collected using standard techniques (Frisancho, 1990) from children attending primary and secondary schools in Yalcoba. The study was conducted in collaboration with the school administration and teachers, and participation was voluntary; fewer than 3% of the children chose not to participate. According to a government census of the locale, the sample represents approximately 85% of the total population between the ages of 6 and 16 (Government of Mexico, 1996). The results, therefore, should be fairly representative of the community as a whole. Child height-for-age and weight-for-height Z-scores from 1998 were calculated using the CDC software package EpiInfo (US Centers for Disease Control and Prevention, 1998), and children were classified by height-for-age using the Waterlow (1984) classification system and weight-for-height using Frisancho (1990). In addition, we collected adult heights and weights from local clinic records, obtaining a sample of 78 adult males and 199 females. The most recently recorded weight for recorded height is used to calculate body mass index (BMI) values.

## 4. Results

Height, weight and BMI means and standard deviations of children measured in 1998 are presented in Table 1. Fig. 1 provides a comparison of Yucatec Mayan children's heights in 1938, 1987 and 1998. Between 1938 and 1987, there was an average increase in stature of about 1 cm for boys and an average decrease in stature of about .5 cm for girls between ages 7 and 13. Between 1987 and 1998, statures increased in boys aged 7–13 by 2.6 cm, and by 2.7 cm in girls. The stature increase between 1987 and 1998 is significant for boys ages 8, 10, 12 and 13, and girls ages 9, 10 and 11. This suggests a measureable but rather small increase in stature associated with regional socio-economic and infrastructural development. Yalcoba children remain short for their ages compared to NCHS

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