

# **Trends in the prevalence of overweight among women in Egypt**

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## **Introduction**

Obesity has many deleterious effects for women of reproductive age. In the first place, obese women are more likely to encounter problems becoming pregnant (Hartz et al. 1979; Norman and Clark 1998; Clark et al. 1998) and obese women are more likely to miscarry during early pregnancy (Lashen et al. 2004). There is a large literature demonstrating that women who are overweight are at greater risk of developing pregnancy complications and problems associated with labor and delivery. Finally, obese women are more at risk of postpartum complications such as infections, hemorrhage and embolisms. Taken all together, maternal mortality and morbidity is significantly elevated for obese women (See for examples of the latest literature: Cedergen et al. 2004; Pathi et al. 2006; Robinson et al. 2005). Maternal obesity is also dangerous for the fetus and the newborn. Obese women are more likely to give birth to a fetus with congenital anomalies and to have infants who are exposed to a significantly higher perinatal morbidity rate (Fretts 2005 and Ramsay et al. 2006). The effects of maternal obesity do not stop at birth - research has shown that babies born to obese mothers are at greater risk of later developing diabetes, cardiovascular disease and obesity themselves (Ramsay et al. 2006).

Egypt, and the countries of the Middle East in general, are typical of many middle income developing countries that have experienced a rapid rise in the prevalence of obesity. Obesity in the Eastern Mediterranean Region has reached 'alarming levels' according to the World Health Organization (Musaiger 2004). The same W.H.O. study pointed out that unlike Europe and North America, obesity is more prevalent among women and in urban areas. Data from the Demographic and Health Surveys show that in 1992, mothers with young children had a mean body mass index (BMI) of 26.9. By 2005, this had risen to a mean BMI of 30.1, with nearly half of Egyptian women of reproductive age classified as obese. Clearly, Egypt is facing extraordinary changes in the prevalence of overweight and obesity in a comparatively short period of time. However, most studies focus on the experience of overweight and

obesity in developed countries, with the emergence of obesity in developing countries a relatively new phenomenon that is little understood.

In this paper, the changes that have occurred in obesity among women of reproductive age in Egypt are described, including socio-demographic, temporal and geographic analyses of obesity in Egypt.

### **Data and methods**

The data are from the Demographic and Health Surveys conducted in Egypt in 1992, 1995, 2000 and 2005. These are large surveys carried out periodically and intended to be uniform to facilitate cross-national comparisons; they are generally representative at the regional level. The surveys provide estimates for key indicators such as fertility, contraceptive use, infant and child mortality, immunization levels, coverage of antenatal and delivery care, nutrition, and anthropometric measurements.

The methodology is similar in each survey, with a three stage sampling process randomly selecting households to be interviewed for the household questionnaire. All ever-married women aged 15-49 who are usual residents or who were present in the sampled households on the night before the interview were eligible for the women's questionnaire. The EDHS have very high response rates. The refusal rate is even lower, since a large proportion of the non-responders were women who were not located by the interviewers Table 1 presents details on the surveys used.

**Table 1: Survey details, 1992-2005**

		Year			
		1992	1995	2000	2005
Household	Number	10,760	15,567	16,957	21,972
	Response rate (%)	98.3	99.2	99.1	98.9
Women	Number	9,864	14,779	15,573	19,474
	Response rate (%)	98.9	99.3	99.5	99.5
Overall response rate		97.2	98.5	98.6	98.4

The outcome variable is based around the body mass index or BMI. The BMI is calculated by the mass (in kilograms) divided by the square of height (in centimeters). While BMI is widely used as a diagnostic tool for obesity, it is not a perfect measure. In particular, BMI is not sensitive to weight due to adiposity and weight due to muscle mass. Further, it takes no account of frame size, body shape and where on the body fat is accumulated – an important determinant in the effect of obesity on health. However, these problems pertain more to BMI as a medical diagnostic tool for individuals. As a statistical categorization, it is still useful for determining obesity since there is a strong correlation between BMI and other, more precise, measures of obesity. It is also readily available and the measurements are reliable and easy to take, based solely on height and weight.

In 1992 and 1995, only mothers with children aged five and under in the household were sampled for anthropometric measurements. As a result, women without young children in the household were excluded. This means that the sample is not representative of all Egyptian women of reproductive age (15-49), with younger and older women under-represented. However, comparing the BMI of ever married women and mothers with children aged under five in the household, women in the more inclusive sample have an even higher mean BMI than women with a young child. Mendez, Monteiro and Popkin (2005) also identified the restriction to women of young children as a limitation to the use of

DHS for obesity studies. They showed that while parity is associated with weight gain, this is only significant for women who were overweight pre-parity. They therefore concluded that the data would be more problematic for estimating obesity or for assessments of the severity of obesity rather than overweight. I therefore decided to focus mainly on the prevalence of overweight, given the concerns with measures of obesity.

Another concern is that the 1992 sample did not sample in the frontier governorates (Red Sea, North Sinai, South Sinai, Matruh and New Valley). While these governorates are sparsely populated, they have seen the most extreme changes in the prevalence of obesity and overweight. However, while studying the changes in these regions is valuable due to the tremendous increase in obesity, the population of these regions is only around one percent of the weighted sample population.

### **Characteristics of the population**

Obviously, there are large differences between the samples that are restricted to mothers with young children and the 2000 and 2005 samples that included all ever-married women. For the most part, these differences result from the prevalent age specific fertility rates; the ‘mothers with young children only’ sample was weighted more toward younger women, whereas the ever-married sample had many more women in their late thirties and forties. However, it must also be remembered that obesity is also a contributing factor to infertility and sub-fertility. It has also been suggested that infertility and sub-fertility contribute to obesity, resulting in a vicious circle leading to increasing obesity (Inhorn 1996).

The sample characteristics between 1992 and 2005, shown in Table 2, are surprisingly similar. As may be expected, the educational level of Egyptian women is increasing. In 1992, 47 percent of mothers of young children had no education. By 2005, this had decreased to only 31 percent. At the same time, the proportion with higher education doubled from nearly five percent to more than 10 percent. There is a

slight trend to a reduction in the proportion of older mothers of young children. This trend is consistent with fertility decline in the Middle East which has tended to be led by older women stopping childbearing (Fargues 2000; Khawaja 2000). The proportion of women aged 35 and older has declined from 27% in 1992 to 22% in 2005.

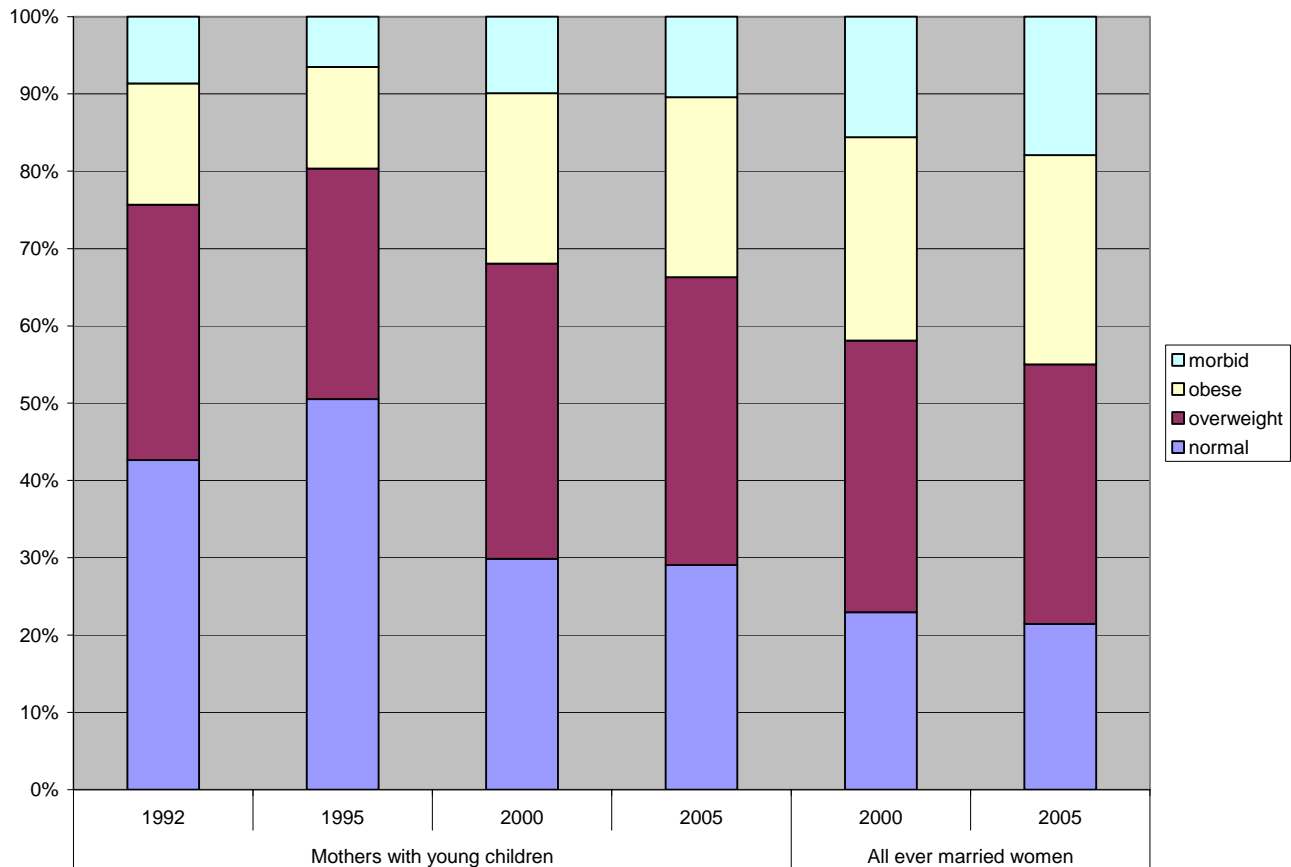
**Table 2:** Sample characteristics 1992-2005, percentages

		Mothers with young children				Ever married women	
		1992	1995	2000	2005	2000	2005
Religion	Moslem	94.4	95.2		95.1		94.5
	Christian	5.6	4.8		4.9		5.5
Age	15-19	3.5	3.9	3.2	3.5	1.7	1.8
	20-24	17.0	18.8	19.8	21.4	10.4	11.4
	25-29	29.0	28.2	29.0	30.2	16.8	17.7
	30-34	23.3	23.0	23.5	22.5	18.0	17.4
	35-39	16.4	16.1	16.3	14.8	19.2	18.5
	40-44	8.6	7.7	6.3	6.3	16.3	17.1
	45-49	2.3	2.4	1.9	1.4	17.6	16.1
Education	None	47.0	43.2	38.6	31.0	44.9	36.4
	Primary	25.0	21.9	16.2	13.1	19.1	16.6
	Secondary	23.1	28.8	36.4	45.5	28.0	37.2
	Higher	4.9	6.0	8.9	10.4	8.1	9.8
Children ever born	1-2	33.9	37.2	42.6	48.1	31.5	35.8
	3-4	31.6	31.8	33.0	34.5	34.7	38.9
	5+	34.5	31.1	24.4	17.5	33.8	25.3
Age at first marriage	14 and under	13.0	13.6	9.5	6.9	12.5	9.8
	15-16	19.0	20.5	17.6	14.5	20.2	16.1
	17-18	22.1	20.5	20.9	21.9	20.7	20.4
	19-20	17.6	16.1	20.3	20.7	18.1	19.2
	21+	28.4	29.2	31.6	35.9	28.4	34.5
Currently working	21.6	18.1	15.3	18.0	17.9	23.1	
Electricity	93.1	95.4	97.7		98.1	99.5	
Radio	62.9	65.8	82.2		83.8	85.5	
TV	52.5	52.3	63.5		91.7	94.6	
Region	Urban governorates	20.8	20.1	17.3	15.1	19.9	17.3
	Lower Egypt Urban	11.4	10.6	12.2	10.2	13.1	11.6
	Lower Egypt Rural	30.1	29.0	31.1	31.4	31.7	32.0
	Upper Egypt Urban	10.4	11.4	11.4	12.6	11.7	12.7
	Upper Egypt Rural	27.3	27.9	26.5	29.6	22.4	25.4
	Frontier		0.9	1.5	1.2	1.3	1.0

**Changes in overweight and obesity between 1992 and 2005.**

In just thirteen years, Egypt has undergone a significant increase in the prevalence of overweight and obesity, as may be seen in Figure 1. The average BMI among mothers of young children has increased from 26.9 in 1992 to 28.6 in 2005. Bearing in mind that the BMI for normal weight is considered 18-25, the trend to increasing BMI is worrying. The BMI for all ever-married women in 2000 and 2005 is even higher. Figure 1 shows that the weight distribution of women is increasingly shifting toward heavier women. Most worrying is the increase in obesity, especially among ever-married women. Between 2000 and 2005, most of the increase in BMI among ever-married women was due to increasing numbers of obese women; the proportion of women normal and just overweight remained approximately the same. The proportion of ever-married women morbidly obese increased nearly 3 percentage points from 15% to 18%.

**Figure 1: Distribution of BMI categories, 1992-2005**



Accordingly, both the mean and median BMI has increased from 1992 to 2005, with a slight dip in 1995 (Table 3). In 2005, both the mean and the median were about 28.

**Table 3: Descriptive statistics, BMI, 1992-2005**

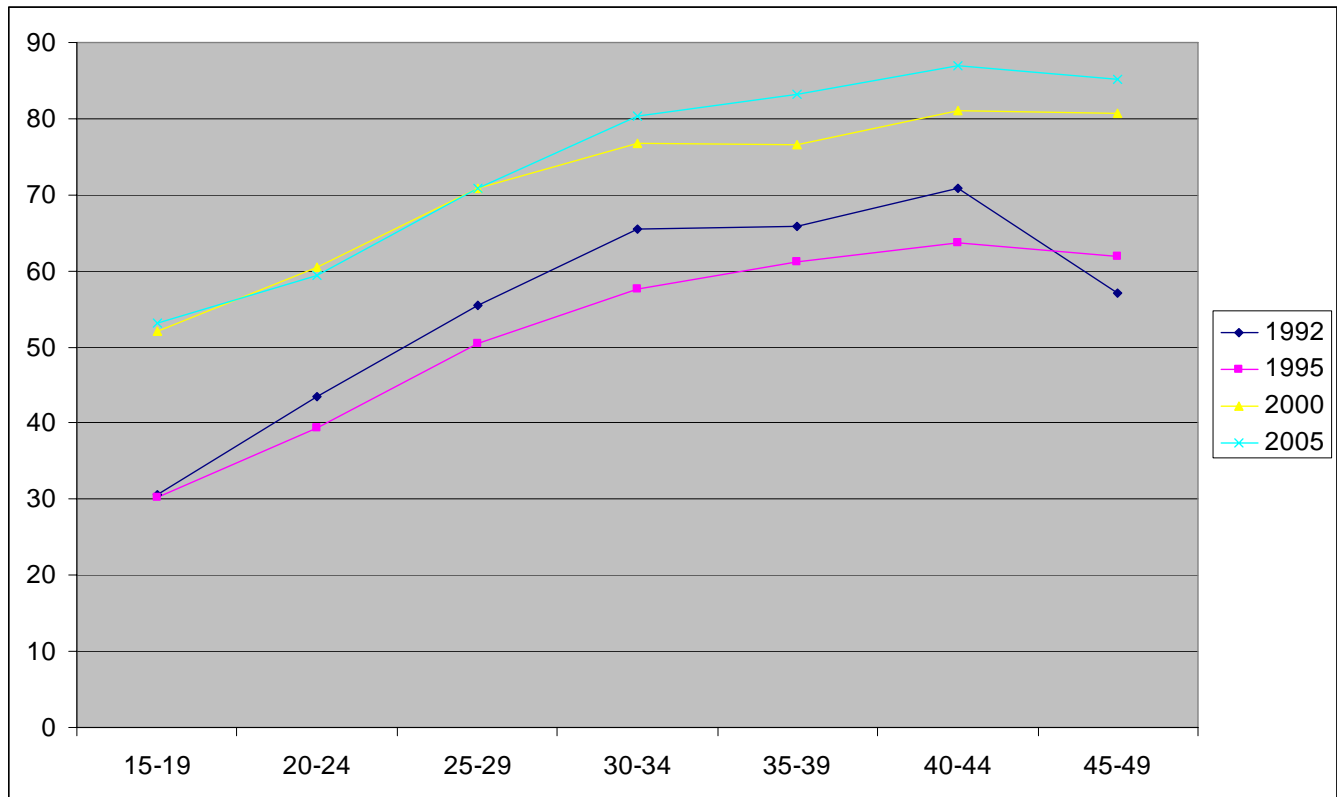
Year	Mean	Median	Standard deviation
1992	26.9	25.9	5427.9
1995	26.3	25.2	5087.5
2000	28.2	27.6	5153.5
2005	28.6	28.0	5245.6

### **Age and cohort effects.**

Although the data used are not longitudinal data, it is still possible to follow age cohorts over the thirteen years covered by the surveys. Looking at the percentage overweight in the different age groups, the gradual increase in percentage overweight with age can clearly be seen (Figure 2), with the steepest increase among younger women. The pattern remains constant, although in 1992 women aged 45-49 had a significantly lower mean BMI than younger women. However, this age group represents a small group of women who had children aged younger than five. The mean BMI of ever-married women in 2000 and 2005 was higher, particularly for older women. In 2005, the percentage overweight of women aged 45-49 was over 92%.



**Figure 2: Percent overweight by age group, 1992-2005**



When the mean BMI is examined from a cohort perspective, the story remains the same, as Table 4 shows:

**Table 4: Mean BMI by cohort and age group**

	15-19	20-24	25-29	30-34	35-39	40-44	45-49
1945-1949							27.5
1950-1954						28.4	30.4
1955-1959					27.8	30.2	31.2
1960-1964				27.3	29.5	31.8	
1965-1969			26.4	29.1	30.3		
1970-1974		25.5	27.9	29.5			
1975-1979	24.6	26.7	28.2				
1980-1984	25.4	26.9					
1985-1989	25.8						

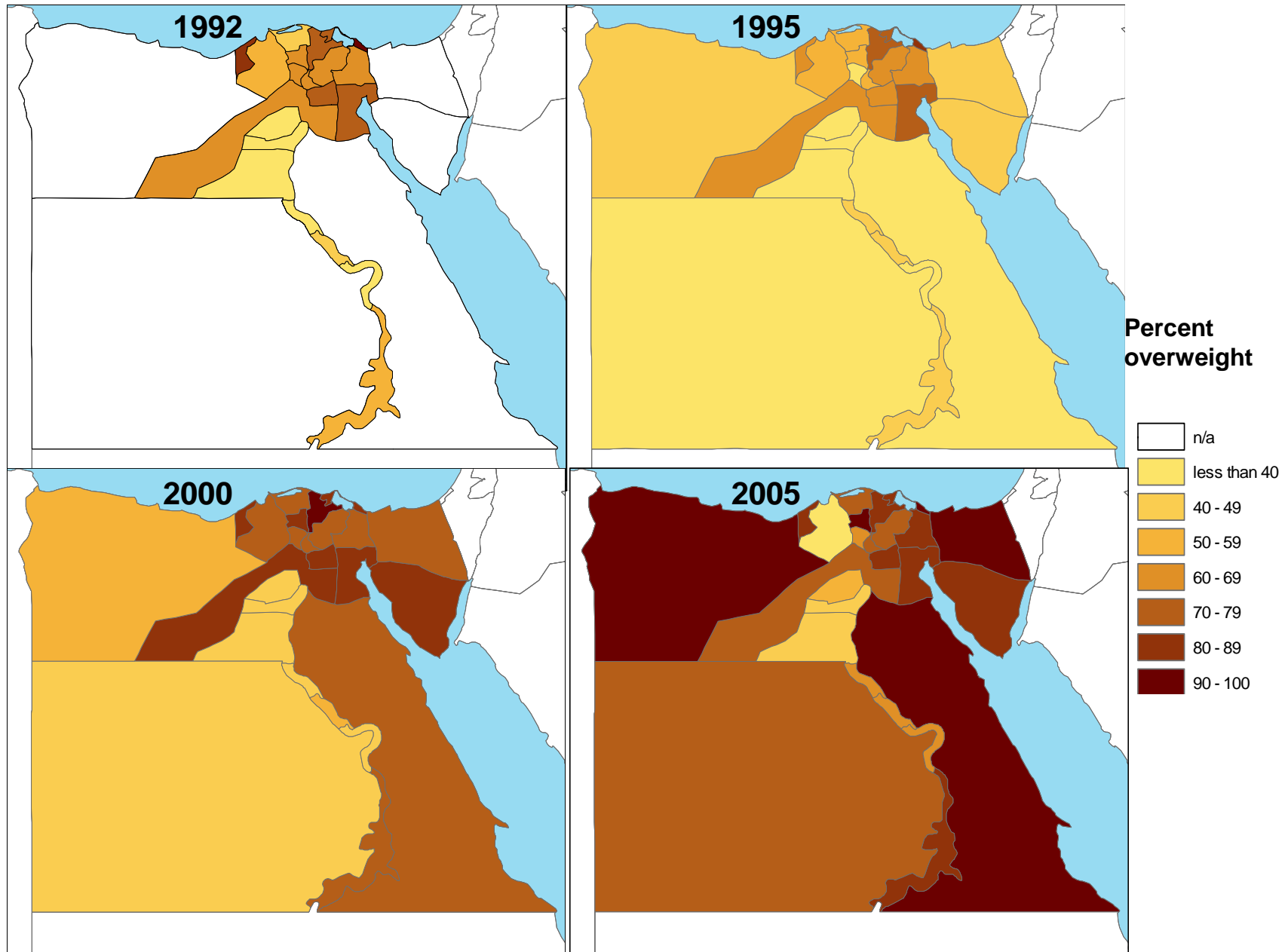
While there are increases in BMI as a cohort ages, there are also increases in the BMI of an age group over time. This increase is seen most sharply in the oldest age groups. Although the 15-19 age group has

seen only an increase in mean BMI of 1.14 between women born in 1975-1979 and women born in 1985-1989 (an increase of 5%), the 45-49 age group has seen an increase of 3.73 (an increase of 14%). This may be partly a function of the fact that only mothers of young children are considered. However, the mean BMI of all ever-married women aged 45-49 and born in 1950-1954 was 31.8, and those born in 1955-1959, 32.9.

### **Geographic difference**

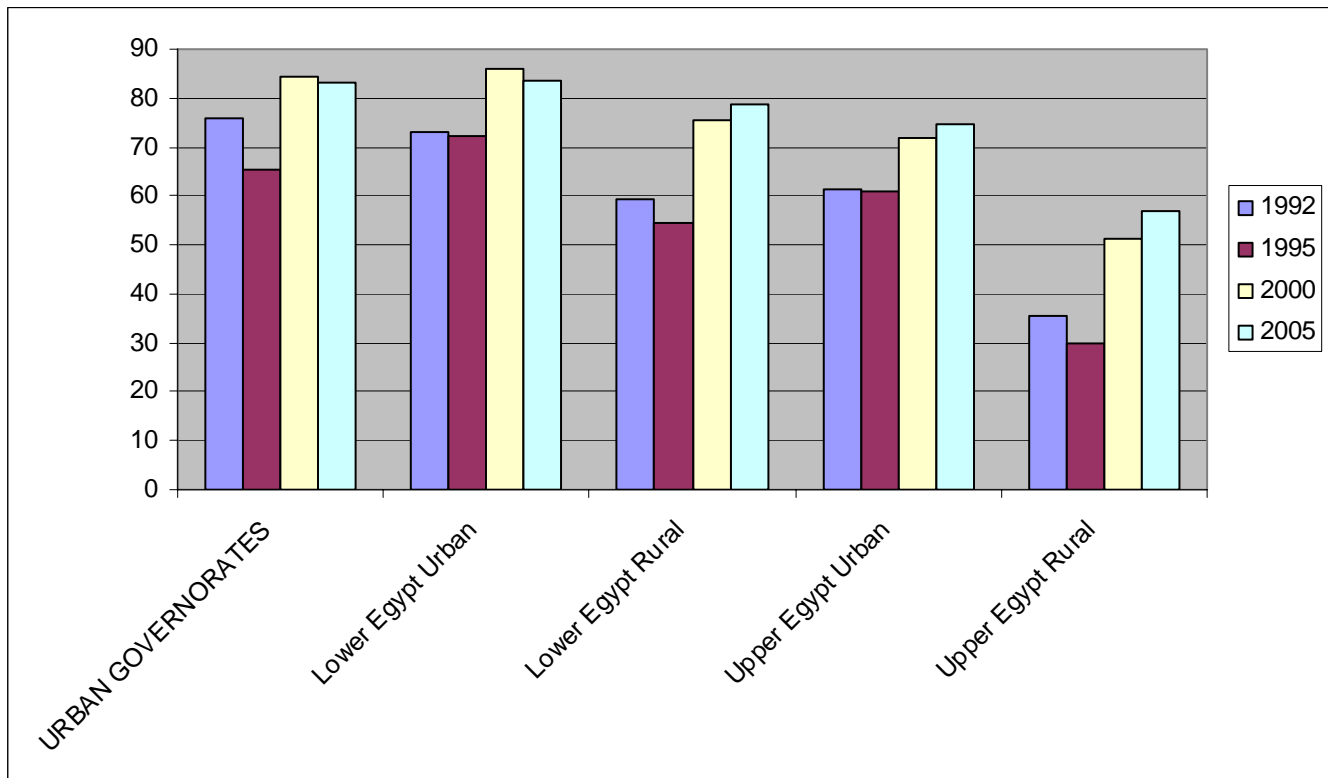
Figure 3 shows that the distribution of overweight and obesity varies dramatically by geographic region.

Figure 3: Changes in percentage overweight by governorate, 1992-2005



As can be seen, the most dramatic changes have been in the frontier governorates on the eastern and western borders. Even at finer geographic delineations, sharp differences exist; a one way analysis of variance found that in all years, there were significant differences according to the primary sampling unit. Figure 4 shows the percent overweight by region and urban/rural characteristics. It seems that in the urban governorates and in other urban areas in Lower Egypt, overweight prevalence is tailing off at very high levels approaching 90%. Rural areas and urban areas in Upper Egypt are seeing further increases in overweight prevalence and the differentials with other areas of Egypt are decreasing.

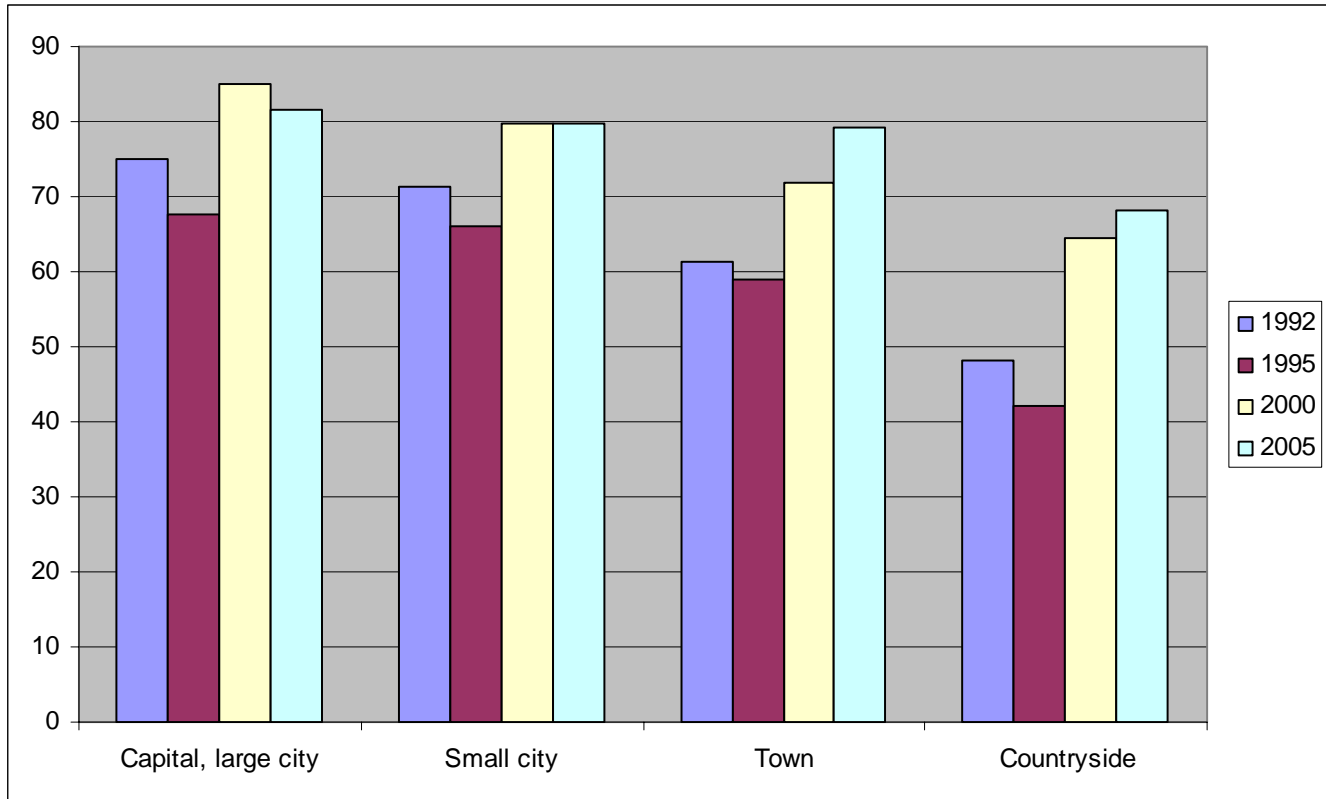
**Figure 4: Prevalence of overweight by region, 1992-2005**



Looking at the type of place of residence in Figure 5, cities have seen little change between 2000 and 2005, with overweight prevalence stable at about 80 percent. Overweight prevalence among residents of

towns has been increasing and in 2005 was about the same as the residents of cities. Countryside residents still have lower rates of overweight than their urban counterparts, although the trend is upward.

**Figure 5: Prevalence of overweight by type of place of residence, 1992-2005**



A controversial hypothesis is that of how childhood conditions affect the later development of obesity. Childhood deprivation may lead to the activation of genes that are associated with metabolic thriftiness. In other words, a person who was undernourished as a child may be more prone to obesity in later life if conditions change (for details on the thrifty gene hypothesis see Barker 1998 and Ellison 2001). Since children in rural areas are more likely to be under-nourished and women in cities are more likely to be obese, prevalence of overweight among women by childhood place of residence and current place of residence may provide evidence for this hypothesis. No evidence could be seen for an additional effect due to childhood residence in the country, as shown in Table 5. The women with the highest prevalence

of overweight were women who had always lived in cities and the lowest were women who had always lived in the country. Women who had moved from the country to the city had rates of overweight midway between women who had always lived in the city and women who had always lived in the country.

**Table 5: Prevalence of overweight by childhood place of residence and current place of residence**

	Stable			Country to		Town to		City to	
	City	Town	Country	Town	City	Country	City	Country	Town
1992	77.4	59.3	47.5	66.8	68.9	55.8	70.3	58.8	66.7
1995	72.0	58.6	40.2	55.8	55.5	61.8	65.6	52.9	67.6
2000	86.1	72.0	63.5	69.7	77.1	71.1	81.2	77.9	80.3
2005*	85.3	77.9	64.5	77.2	71.7	71.5	80.1	74.6	87.1

\*For 2005, previous place of residence used as childhood place of residence was unavailable.

### Socioeconomic characteristics

The prevalence of obesity and overweight also differs by socioeconomic characteristics (Table 6).

Women with higher education have the highest prevalence of overweight. However, the differentials are decreasing. While all educational groups have increasing rates of overweight, women in the lowest educational categories have increased the most; women in the highest education category increased only about eight percentage points between 1992 and 1995— an increase of seven percent, while the equivalent figures for women with no education were 18 percentage points, representing an increase of 33 percent. Clearly, the lowest educated women are quickly catching up with their more educated counterparts in the prevalence of overweight. Moslems tend to have slightly higher rates of overweight than Christians. Furthermore, the differentials show signs of decreasing over time. Although overweight is generally associated with infertility, as the number of children ever born increases so does weight. This is most likely due to the increasing age associated with children ever born. A higher age of marriage is also associated with a higher prevalence of overweight. Again, this is associated with age since the age of marriage has been decreasing over time. However, it is also an indicator of women's

status and may have an independent effect on obesity. Electricity supply can have an effect on the activity level of women in the household, since electricity is necessary for many of the household labor saving devices but the differential between those with electricity and those without has been decreasing. Finally, television viewing is associated with physical inactivity and has often been held partially responsible for the increase in obesity.

**Table 6: Prevalence of overweight by socio-demographic characteristics**

		1992	1995	2000	2005
Education	None	48.5	42.1	63.2	66.1
	Primary	62.9	55.4	72.4	72.5
	Secondary	67.7	61.2	77.0	75.6
	Higher	77.5	71.3	82.4	82.9
Religion	Moslem	58.2	52.4		73.2
	Christian	51.9	48.6		68.8
Children ever born	1-2	53.1	50.2	69.5	68.5
	3-4	61.1	54.9	74.9	76.9
	5+	59.5	51.9	69.9	77.7
Age at first marriage	less than 14	52.9	41.5	62.3	65.2
	15-16	51.2	43.5	64.4	66.5
	17-18	52.2	52.0	68.0	68.2
	19-20	60.7	56.3	73.6	72.5
	21+	67.4	61.2	78.9	80.3
Currently working	No	56.6	51.2	69.8	72.5
	Yes	62.6	56.7	80.0	75.4
Electricity	No	40.8	32.1	53.2	72.1
	Yes	59.2	53.2	71.8	81.9
TV	No	43.1	41.5	55.8	57.5
	Yes	62.3	55.0	73.0	74.1

## Conclusion

Obesity and overweight have been increasing in Egypt over the last decade and are now at levels that are even higher than those seen in the West. This level of overweight is even more extraordinary in comparative perspective given the relatively low level of development of Egypt vis-à-vis developed countries. The magnitude of the problem and the vast differences in patterns of overweight compared with those in the West justify studying overweight in developing societies in their own right. It is clearly not appropriate to assume that studies conducted in the West will apply to non Western societies. The

problems associated with overweight and obesity are critical for women of childbearing age, since obese and overweight women are at greater risk of both infertility and complications associated with pregnancy and childbearing.

It is apparent that while urban and more highly educated women are at most risk of being overweight, this differential is being reduced. It is possible that urban and higher educated women have reached saturation point with regards to the prevalence of overweight, albeit at very high levels, and the differentials will now manifest themselves in prevalence of obesity and morbid obesity. However, it is also possible that as Egypt develops, people will adopt the social patterns of overweight and obesity prevalent in developed countries where overweight is more prevalent among lower SES segments of the population. This process may be geographically differentiated. In other words, Lower Egypt will reach a pattern similar to developed countries faster than Upper Egypt and the Frontier Governorates.

This study is a first step in exploring a complex and multifaceted phenomenon. Clearly, obesity and overweight in Egypt are socially determined. A highly educated woman living in Cairo is much more likely to be overweight than an uneducated rural woman from Upper Egypt. However, the extent to which it is education and place of residence *per se*, or other factors associated with education and place of residence, such as women's status and female autonomy, is not clear. Further, while it appears that residence and education are having less of an effect over time, this may be due to other secular trends and not necessarily a change in the relationship. The next step in this study is to conduct multivariate analyses to identify the significant determinants of overweight and obesity, quantify their effect and determine whether these relationships are changing over time.



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