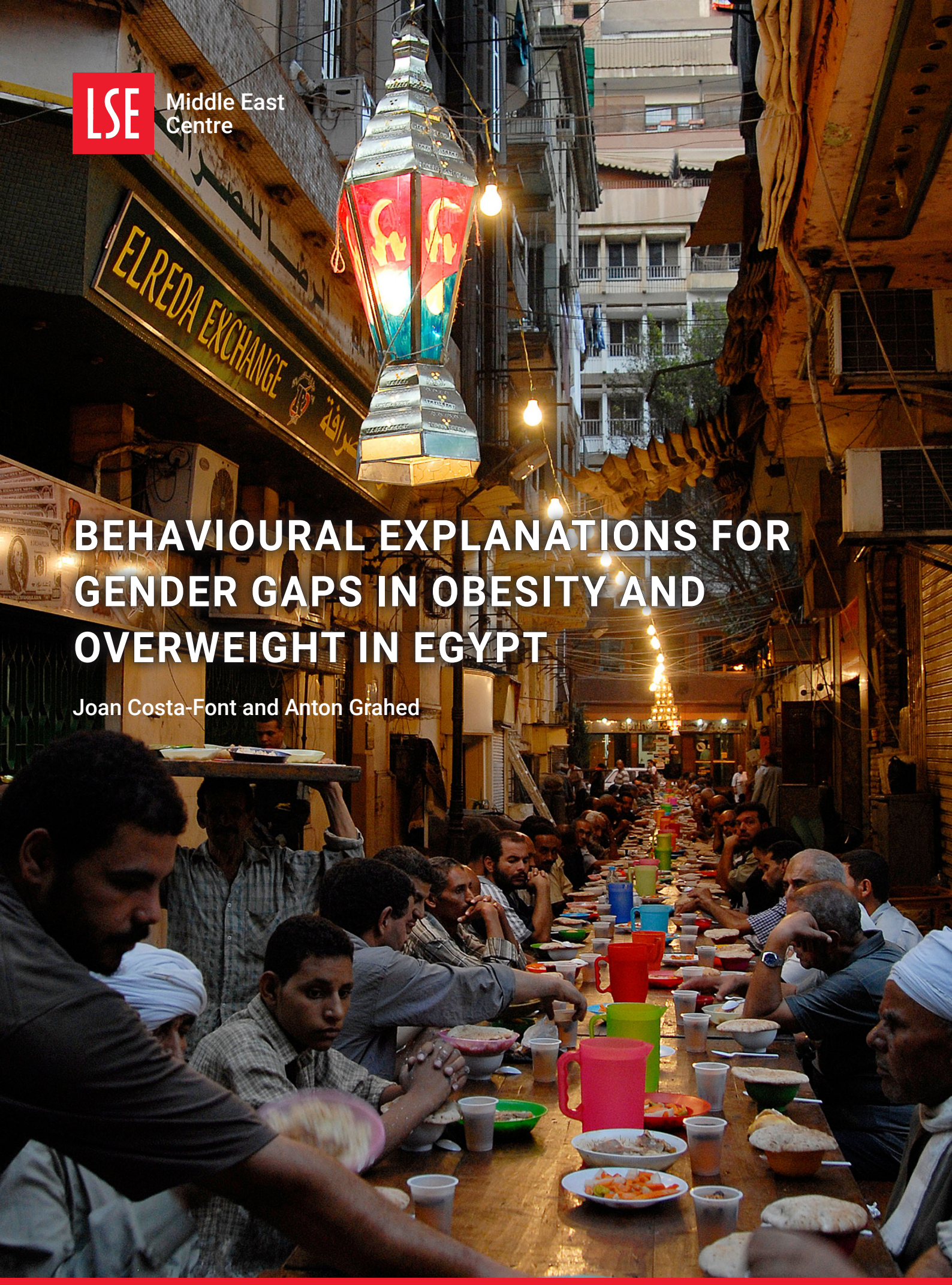


LSE Middle East Centre

# BEHAVIOURAL EXPLANATIONS FOR GENDER GAPS IN OBESITY AND OVERWEIGHT IN EGYPT

Joan Costa-Font and Anton Grahed

LSE Middle East Centre Paper Series | 81 | December 2023

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# Behavioural Explanations for Gender Gaps in Obesity and Overweight in Egypt

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## About the Authors

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## Abstract

Prior research has documented large disparities in obesity and Body Mass Index (BMI) among women and men in the Middle East. While such gaps are often associated with differences in labour market participation, we still know little about the effect of specific behavioural mechanisms at play. This paper presents novel evidence from a representative survey of 2000 individuals in Egypt, examining weight alongside demographic and behavioural attitudes. In addressing this gap, this project presents new evidence from a representative survey of 2000 individuals in Egypt, examining whether body attitudes and perceptions (which we summarise as 'adiposity aversion' (AA)) play a role, alongside more common explanations such as differences in dietary preferences, physical activity, and time and income barriers related to socio-economic status (SES). In addition to examining gaps in BMI across gender and its determinants, we draw on Principal Component Analysis (PCA) methodology to summarise different social and behavioural constructs, and we then use regression analysis to identify its influence on BMI and obesity rates. As expected, our results document a clear gender gap in BMI, driven primarily by a larger share of women being obese, which is more prevalent among married women with low SES. Against the backdrop of differential attitudes explaining gender gaps in BMI, our regression estimates suggest that obesity and BMI are mainly driven by differences in physical activity, and SES.

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# Introduction

Societies in the MENA region, while historically rooted in distinct cultural and religious practices, are increasingly exposed to western habits and lifestyles.[1] However, exposure to these new lifestyles is far from uniform across socioeconomic groups. Individuals differ in their social norms, or in their reference points with regards to body weight, diet and physical activity.

Previous research has shed light on the prevalence of gender disparities in overweight[2] within the Middle East and North Africa (MENA) region.[3] This body of work suggests a relationship between gender differences in overweight and broader gaps in employment and social participation. However, to date we still know little about what drives such gender gaps in obesity and adiposity measures using the individual's Body Mass Index (BMI), or the underlying mechanisms driving these differences. Are such differences the result of physical activity gaps? Are they explained by differences in attitudes towards their expected body shape, which we refer to as 'adiposity aversion' (AA)? Are they instead driven by cultural differences in dietary behaviours? Or simply by material deprivation, constraining healthy lifestyles? This project investigates the role of such behavioural explanations driving the formation of health-related social norms,[4] alongside other economic drivers of individuals' adiposity such as physical activity, diet and socio-economic status (SES), and examines how they influence overweight in Egypt.

A common method to study the role of behavioural explanations with regards to body weight, diet and physical activity incudes the use of survey instruments which provides us with the data to carry out our empirical analysis. This is the approach we follow in this paper. Survey questions allows for the elicitation of attitudes, and differences in social attitudes towards body weight can play a significant role in the observed gender-specific overweight rates. Such variation in attitudes, we hypothesise, may explain the persistence of unique health-related behaviours and lifestyles over time (as they can suggest different reference points with regards to an 'ideal body weight'), with the Middle East being a particularly important setting to study this question due to the substantial gender differences in overweight rates. However, such attitudes are often constrained by individuals' incomes and by social norms with regards to diet and exercise. This project will contribute to the understanding of the behavioral explanations for gender differences in overweight as follows:

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[1] Joan Costa-Font and Núria Mas, '"Globesity"? The Effects of Globalization on Obesity and Caloric Intake', *Food Policy* 64 (2016), pp. 121–32

[2] Overweight is defined as an individual having a Body Mass Index (BMI) greater than 25, while Obesity is defined as an individual having a BMI greater than 30. BMI is in turn, defined as the weight of an individual (in kg) divided by the height (in metres) squared of that individual. Note that any mention of overweight implicitly refers to individuals being overweight and above (so overweight or obese).

[3] Joan Costa-Font and Mario Györi, 'The Weight of Patriarchy? Gender Obesity Gaps in the Middle East and North Africa (MENA)', *Social Science & Medicine* 266 (2020), p. 113353.

[4] Social norms are potentially relevant as they constitute constraints for healthy behaviour and understanding them is crucial for preventing serious health issues.

First, we use a novel survey experiment collected between March–May 2021, specifically designed to elicit gender-related attitudes to diet and physical activity. Of particular importance is what we term as adiposity aversion, influencing individuals' acceptance of one's body weight. Second, it attempts to broaden our understanding of the demographic determinants of BMI and its differential impact across genders in Egypt's unique context (and by extension, the MENA region), which presents distinct institutional and societal barriers to maintaining healthy weight compared to Western countries. Third, we draw on a Principal Component Analysis (PCA) to summarise the diffuse notions of socio-economic status (SES), diet, physical activity, and adiposity aversion (AA) into concrete synthetic indicators, and assess the significance of these indicators as factors associated with BMI when adjusting for geographic and demographic characteristics.

Our findings underscore the role of broad behavioural and socio-economic influences[5] of overweight.[6] In the MENA region, historical views have traditionally seen plumpness as a positive attribute for women. Yet, contemporary research in the MENA region indicates a shift toward a Westernised ideal of the perfect body shape.[7] As we show in this project, this shift is observable in Egypt too, as traditional views that equate plumpness with beauty are being reassessed amid rapid societal changes and adoption of Western lifestyle norms, especially in urban regions. Another stylised fact prevalent in developing countries is the perception of obesity as a symbol of wealth. Indeed, Macchi has observed that in Uganda, obesity appears to be a factor in gaining better access to credit.[8] However, it is unclear whether this phenomenon applies across the board in other world regions such as the Middle East. In this paper, we examine whether gaps in obesity and BMI differences result from differences in diet, physical activity, and more broadly in differences in SES as in other western countries.

The structure of the paper is as follows. We first summarise the related literature on the correlates of BMI (and overweight), focusing particularly on gender-based differences among these correlates in the MENA region, and emphasising the context of Egypt. The following section describes the survey dataset used. We then present descriptive statistics concerning the demographic factors linked to BMI and overweight. The subsequent section employs Principal Component Analysis to distil the influence of diverse social and behavioural aspects – ranging from socioeconomic status to attitudes toward body size and including exercise and dietary habits – on BMI and obesity levels. A concluding section synthesises the study's findings.

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[5] Joan Costa-Font, Daniele Fabbri and Joan Gil, 'Decomposing cross-country differences in levels of obesity and overweight: does the social environment matter?', *Social Science & Medicine* 70/8 (2010), pp. 1185–93.

[6] Differences in eating habits and education between the two Mediterranean countries were able to partly explain cross country differences in body mass index gap. Indeed, the country specific social environment was found to absorb most of the difference in the BMI gap, while the effect of eating habits disappeared.

[7] Najat Yahia, Hiba El-Ghazale, Alice Achkar and Sandra Rizk, 'Dieting Practices and Body Image Perception among Lebanese University Students', Asia Pacific Journal of Clinical Nutrition (2011), pp. 21–8.

[8] Elisa Macchi, 'Worth your Weight: Experimental Evidence on the Benefits of Obesity in Low-Income Countries', *American Economic Review* 113/9 (2023), pp. 2287–322.

# Related Literature

## Correlates of Obesity and Overweight

Previous research has identified an array of factors – spanning from genetic or physiological to technological and economic – that contribute to obesity, overweight and adiposity (BMI). Specifically, socio-economic status, urbanisation and labour force participation are among the noted influences. The socio-cultural environment is generally regarded as a primary determinant affecting individual weight by shaping time-use decisions and defining acceptable behaviours. Costa-Font and Mas have examined the interplay between social globalisation and obesity rates.[9] Analysing various globalisation indices and controlling for other socio-economic and geographical factors across 23 countries,[10] they observe a positive relationship between social globalisation and obesity, whereas economic globalisation does not exhibit a significant impact. The study argues that the potential influences of economic globalisation are indirectly captured through micro-mechanisms such as women's labour force participation, income and food prices. Nonetheless, the concept of social globalisation at a micro-level, and whether Western-based findings are applicable in differing contexts with different social norms, remains an area requiring further exploration. Additionally, Costa-Font and Gyori have shown that gender inequalities in obesity are most prevalent in the Middle East compared to other regions, and they seem to be associated with changes in labour market participation.[11] However, whether these labour market participation effects arise due to differences in adiposity aversion or due to differences in habits (such as physical activity) is largely unknown.

## The Role of Behavioural Fundamentals of Overweight

Gender disparities in health are intertwined with broader behavioural and socio-environmental factors alongside gender biases in society, which impose wider constraints on people's health behaviours. For example, studies have shown that gender inequality can exacerbate mental disorders, especially among women, which in turn can explain a rise in obesity and adiposity. In environments where gender inequality prevails, being female can prompt a sense of belonging to a 'less valuable group', potentially undermining the development of positive self-esteem,[12] which is more common among low SES groups in western societies. Additionally, there is often an expectation of women to prioritise the welfare of others over their own in patriarchal societies.[13]

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[9] Costa-Font and Mas, '"Globesity"?'.

[10] Australia, Austria, Canada, Denmark, Estonia, Finland, France, Hungary, Ireland, Italy, Japan, Lithuania, Malaysia, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, the UK and the US.

[11] Costa-Font and Györi, 'The Weight of patriarchy?'.

[12] Lesley Doyal and Sarah Payne, 'Gender and Global Health: Inequality and Differences', *Global Health and Global Health Ethics* (2011), pp. 53–62.

[13] Deniz Kandiyoti, 'Identity and its Discontents: Women and the Nation', *WLUML* (Women Living under Muslim Laws) Dossier 20 (1998).

Previous studies[14] focusing on the decomposition of cross-country BMI gaps have identified lifestyle, socio-economic and socio-environmental factors as significant determinants of these country-differences. The role of social norms on the obesity epidemic is also investigated in Costa-Font et al.[15] showing that obesity differences in Italy and Spain can be associated with social norms influencing physical appearance. However, while there were cross-country differences, the research did not reveal any differential effect of these social norms on men and women.[16] This stands in direct contrast with the MENA region, where there are not only cross-country differences, but a large and puzzling difference in overweight and obesity among men and women, a fact which has not been extensively studied in the literature, and which we focus on in this project.

## Obesity and Overweight in Middle East and Egypt

Egypt registers one of the highest obesity rates globally (even compared to other MENA countries),[17] with 39.8% of its adult population being obese as of 2019. The incidence is disproportionately higher among adult females, at 49.5%, in contrast to adult males, at 29.5%. Obesity is one of the top contributors to mortality of Egyptians along with other non-communicable diseases (NCDs) like hypertension and diabetes. Aitsi-Selmand et al.[18] studied the relationship between wealth, education, and obesity among 49,058 Egyptian women using the Demographic and Health Survey (DHS).[19] Their findings suggest that obesity predominates among women with only primary education or less, who are economically disadvantaged or hail from rural areas. Despite the gravity of the issue, only a limited number of studies have probed into the factors associated with female obesity in Egypt. One such investigation, analysing Egyptian DHS data between 1992–2008, identified a correlation between women's income levels and obesity in Egypt.[20]

[14] Joan Costa-Font, Daniele Fabbri and Joan Gil, 'Decomposing Body Mass Index Gaps between Mediterranean Countries: A Counterfactual Quantile Regression Analysis', *Economics & Human Biology* 7/3 (2009), pp. 351–65.

[15] Costa-Font, Fabbri and Gil, 'Decomposing Cross-Country Differences in Levels of Obesity and Overweight'.

[16] Costa-Font et al. (2009) investigates the body mass index gap between Italy and Spain and find differences in eating habits and education between the two countries to be the main predictors. However, the inclusion of the social environment can explain most of the difference in the BMI gap, while the effect of eating habits disappears. Given that the two countries share socio-cultural and geographical traits; are both Mediterranean; have comparable income per capita levels, and the same level of dietary compliance with the World Health Organization nutrition targets (Mazzocchi, Brasili & Sandri, 2008) we would expect to find less variation when it comes to obesity levels (see Mario Mazzocchi, Cristina Brasili and Elisa Sandri, 'Trends in Dietary Patterns and Compliance with World Health Organization Recommendations: A Cross-country Analysis', *Public Health Nutrition* 11/5 (2008), pp. 535–40.

[17] The MENA area is alone responsible for the global relationship between women's empowerment and gender-based obesity inequalities (Costa-Font and Gyory, 2020). Removing the MENA region from the equation cancels out the global association between women's empowerment and the gender obesity gap. MENA comprises high-income and low-income countries with the same culture and gender norms (Kanter, 2012).

[18] Amina Aitsi-Selmi et al., 'Interaction Between Education and Household Wealth on the Risk of Obesity in Women in Egypt', *PloS One* 7 (2012).

[19] Céline Miani et al., 'Measurement of Gender as a Social Determinant of Health in Epidemiology—A Scoping Review', *PLoS One* 16/11 (2021).

[20] Ibid.

Dietary patterns serve as a key explanatory factor for obesity in Egypt, which underwent significant changes during the last decades of the twentieth century, largely due to market liberalisation and the subsequent influx of Western goods and lifestyle.[21] Asfaw[22] finds a negative correlation between the BMI of Egyptian women and the (subsidised) price of *balady* (pita) bread. An implication of this finding is that policy which keeps the price of *balady* low may inadvertently contribute to high BMI levels. Additionally, the food subsidy program aimed at assisting economically disadvantaged households by offering staples like bread, sugar, and oil at reduced prices, reduces the cost of obesity.[23] Despite accounting for only 4% of food expenditures, such subsidised items constitute 31% of the caloric consumption in Egypt.

Further compounding the issue is the relationship between BMI, high caloric intake, and a sedentary lifestyle among Egyptian women.[24] An increase in calorie intake coupled with a decline in nutritional quality has been recorded, a trend potentially exacerbated by the widespread eligibility for food subsidies, with 80% of the Egyptian population qualifying for this aid. Alebshehy's work also found a strong association between eating comfort food or snacking while watching television and female obesity. In addition to the consumption of foods that are calorically dense, yet nutritionally poor, physical inactivity is another factor contributing to the obesity trend in Egypt. While the Survey of Young People in Egypt[25] indicates relatively low rates of inactivity during commutes to work or school – 19.4% for females and 6.2% for males – this data lacks detail on the type, duration, or intensity of the physical activities undertaken. In contrast, the WHO's more comprehensive stepwise survey between 2011–12 estimates the prevalence of inactivity in Egypt being 32%, which in addition reveals a significant gender disparity. That is, 42% of women are inactive compared to 23.3% of men.[26]

However, these figures on their own do not fully account for the pronounced gender obesity gap in Egypt, which is the widest among Arab nations, despite the country reporting a comparatively modest level of inactivity. The reported inactivity levels in other Arab countries are much higher, surpassing 40% with men's inactivity rates ranging from 26% to 85% and women's from 43% to 91%. Thus, other explanations will contribute to the gender obesity gap beyond self-reported activity levels.

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[21] Habiba Hassan Wassef, 'Food habits of the Egyptians: Newly Emerging Trends', *Eastern Mediterranean Health Journal / La revue de santé de la Méditerranée orientale / al-Majallah al-sihiīyah li-sharq al-mutawassit* 10 (2004), pp. 898–915.

[22] Abay Asfaw, 'Do government food price policies affect the prevalence of obesity? Empirical evidence from Egypt', International Food Policy Research Institute (IFPRI) 35/4 (2007), pp. 687–70.

[23] Abay Asfaw, 'Micronutrient Deficiency and the Prevalence of Mothers' Overweight/Obesity in Egypt', *Econ Hum Biol* 5/3 (2007), pp. 471–83. doi:10.1016/j.ehb.2007.03.004

[24] Raouf Alebshehy, Nura Musa Shuaib, Jato Denis Mbako, Dina Barffo and Roland Kuuzagr Nuotol, 'Determinant Analysis of Obesity among Adult Females in Egypt', *The Egyptian Journal of Hospital Medicine* 65/1 (2016), pp. 662–9.

[25] Population Council, 'Survey of Young People in Egypt', *West Asia and North Africa Office*, 2011. Available at: http://www.popcouncil.org/pdfs/2010PGY_SYPEFinalReport_FrontMatter.pdf (accessed 12 December 2023).

[26] World Health Organisation, 'More Active People for A Healthier World: Global Action Plan On Physical Activity 2018–2030', *WHO*, 2008. Available at: https://www.who.int/publications/i/item/9789241514187 (accessed 12 December 2023).

Egyptian women also report higher stress-levels than males, with many resorting to comfort food as a coping mechanism.[27] This may be linked to the fact that the MENA region has the highest gender gap in terms of unpaid domestic care and work.[28] In Egypt, married women spend at least 30 hours per week on household responsibilities. Despite evolving gender roles, the traditional expectations of men as breadwinners and women as housewives are still strongly emphasised. In traditional families, men do not assist in the 'domestic work role' of the women, but still, women often support the 'financial provider role' of the male. Therefore, the health and well-being of Egyptian women are impacted by these dynamics, as they prioritise the needs of others, and some evidence documents that they consume healthcare products that are cheaper than those that men consume.[29]

Finally, it is possible to identify several behavioural explanations for the higher levels of overweight among women. In the Egyptian cultural context, being overweight and inactive has historically been perceived positively, and associated with status, wealth, health and fertility.[30] In Egypt, societal acceptance of higher body weight in women persists, while in MENA countries in general, plumpness can be regarded as a sign of beauty in females;[31] this perception is shifting however, especially among more affluent women, as Western ideals increasingly influence body image preferences. Body image – how individuals perceive their size, shape, and general appearance – have significant impact on behaviour. Body shape dissatisfaction is associated with abnormal eating habits, such as binge eating, which may lead to unintentional weight gain over time. While the social environment has an impact on body shape satisfaction, the influence of the media promoting a 'thin ideal' for female beauty is particularly severe.[32]

[27] Walid El Ansari and Gabriele Berg-Beckhoff, 'Nutritional Correlates of Perceived Stress among University Students in Egypt', *International Journal of Environmental Research and Public Health* 12/11 (2015), pp. 14164–76.

[28] UN Women, 'The Role of the Care Economy in Promoting Gender Equality', UN Women – Egypt, 2020. Available at: https://egypt.unwomen.org/en/digital-library/publications/2020/12/unpaid-care-report (accessed 12 December 2023).

[29] Lori Heise et al., 'Gender Inequality and Restrictive Gender Norms: Framing the Challenges to Health', *The Lancet* 393/10189 (2019), pp. 2440–54.

[30] Rebecca Kanter and Benjamin Caballero, 'Global Gender Disparities in Obesity: A Review', *Advances in Nutrition* 3/4 (2012), pp. 491–8.

[31] Fatima Garawi et al., 'Do Routinely Measured Risk Factors for Obesity Explain the Sex Gap in its Prevalence? Observations from Saudi Arabia', *BMC Public Health* 15 (2015), p. 254.

[32] Patricia van den Berg et al., 'Body Dissatisfaction and Body Comparison with Media Images in Males and Females', *Body Image* 4/3 (2007), pp. 257–68.

# Data

This study draws on a unique dataset that has collected a rich set of information of both men and women in Egypt between March and May 2021, which includes demographic and dietary information as well as individuals' body change and cultural attitudes regarding weight. It should be emphasised that the interviews were conducted during the Covid-19 pandemic. Therefore, respondents were asked about their weight before and after the outbreak. While the link between Covid-19 and weight is intriguing, we did not find any noticeable variation in self-reported weight in the period examined. As a result, we will concentrate on their self-reported weight before the pandemic. The survey was conducted by the Institut Public de Sondage d'Opinion Secteur (IPSOS), a multinational market research firm using the Computer-Assisted Telephone Interviewing (CATI) methodology. This survey is meant to be representative of the Egyptian population in terms of geographic coverage, gender, region, socioeconomic condition, and age. The company conducted 2000 CATI interviews with real time quota control and some of the key questions included are listed in the Appendix.

The Body Mass Index (BMI) is calculated based on the self-reported weight and height of the survey respondents. While there is a concern of systematic underreporting of weight due to social norms, which would underestimate individuals' BMI, studies have shown a good degree of agreement between self-reported and directly measured weight (and height).[33]

Socioeconomic conditions were determined by a multitude of factors, giving each respondent a Socioeconomic Score (SES) based on their answers to questions involving travel, household appliances, car ownership, monthly income, residence area, and so on. Based on their score, individuals were then categorised as high income (A), upper middle (B), lower middle (C, split further into 2 sub-groups: C1 and C2), low (D) and very low income (E). The survey also included questions on the participants' eating behaviour and exercise patterns. It primarily investigated comfort food, i.e. High Fat Diet (HFD) food and sugary drinks, using certain types of Egyptian traditional foods as examples.

Table 1 reports the overall and gender-specific mean and standard deviation of key-characteristics in our sample. The average BMI is 27.4, about 28 for women and 26.8 for men. This effects is driven by the fact that average obesity is estimated at 25% for women and 16% for men, a 9 percent gap. In contrast men are more likely to be overweight and normal weight than women. 49% of respondents are female and 51% are male, with 78% of the sample being married (84% of men and 71% of women), and 74% of the sample reporting they have or have had children. 21% are aged 18–24, 27% are aged 25–34, 20% between 35–44, 15% 45–55, and 17% are aged 55 and above. In terms of location 20% are from Cairo, 6% are from Alexandria, 31% from upper Egypt, and the remaining are from the Delta area. For individuals socio-economic characteristics, we find that 48% of respondents self-classify as having a low socio-economic status (SES), while 40% are middle-low, 8% are upper-middle, and 4% exhibit a high socio-economic status.

[33] Kee Chee Cheong et al., 'Validity of Self-Reported Weight and Height: A Cross-Sectional Study among Malaysian Adolescents', *BMC Med Res Methodol* 17/85 (2017). Available at: https://doi.org/10.1186/s12874-017-0362-0 (accessed 11 December 2023).

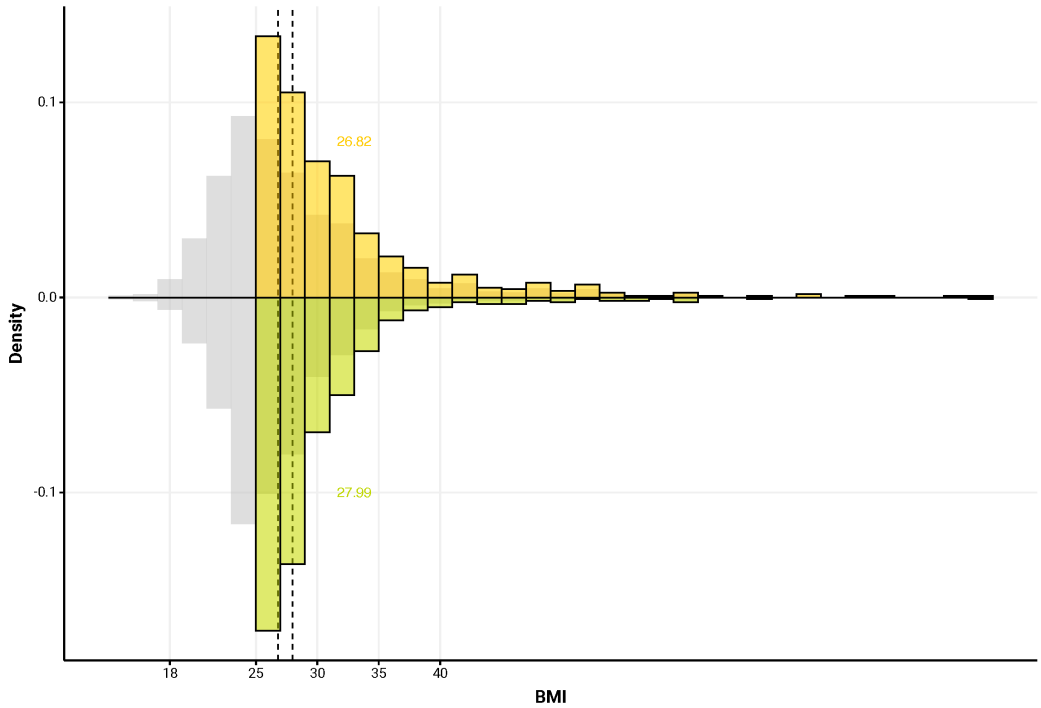
Table 1: Descriptive Statistics of Demographic Characteristics

| | General Sample | | Female Only | | Male Only | |
|---|---|---|---|---|---|---|
| | (1) Mean | (2) SD | (3) Mean | (4) SD | (5) Mean | (6) SD |
| **BMI** | 27.391 | 6.915 | 27.989 | 7.88 | 26.817 | 5.786 |
| **Underweight** | 0.016 | 0.126 | 0.018 | 0.134 | 0.014 | 0.116 |
| **Normal** | 0.385 | 0.487 | 0.376 | 0.485 | 0.394 | 0.489 |
| **Overweight** | 0.391 | 0.488 | 0.353 | 0.478 | 0.426 | 0.495 |
| **Obese** | 0.208 | 0.406 | 0.253 | 0.435 | 0.166 | 0.372 |
| **Aged 18-24** | 0.207 | 0.405 | 0.282 | 0.45 | 0.135 | 0.342 |
| **Aged 25-34** | 0.273 | 0.446 | 0.222 | 0.416 | 0.322 | 0.467 |
| **Aged 35-44** | 0.204 | 0.403 | 0.209 | 0.407 | 0.199 | 0.399 |
| **Aged 45-54** | 0.147 | 0.354 | 0.154 | 0.361 | 0.14 | 0.347 |
| **Aged 55+** | 0.169 | 0.375 | 0.133 | 0.339 | 0.204 | 0.403 |
| **Married** | 0.777 | 0.416 | 0.704 | 0.457 | 0.847 | 0.36 |
| **Have Children** | 0.74 | 0.439 | 0.65 | 0.477 | 0.825 | 0.38 |
| **Live in Alexandria** | 0.06 | 0.238 | 0.077 | 0.266 | 0.044 | 0.205 |
| **Live in Cairo** | 0.2 | 0.4 | 0.282 | 0.45 | 0.122 | 0.327 |
| **Live in Delta** | 0.43 | 0.495 | 0.418 | 0.494 | 0.441 | 0.497 |
| **Live in Upper Egypt** | 0.31 | 0.463 | 0.223 | 0.417 | 0.393 | 0.489 |
| **Education Technical +** | 0.569 | 0.495 | 0.667 | 0.471 | 0.475 | 0.5 |
| **Travel Omra Hadj** | 0.313 | 0.464 | 0.343 | 0.475 | 0.284 | 0.451 |
| **Socioeconomic Cat. A** | 0.037 | 0.189 | 0.041 | 0.198 | 0.033 | 0.18 |
| **Socioeconomic Cat. B** | 0.083 | 0.276 | 0.089 | 0.285 | 0.077 | 0.267 |
| **Socioeconomic Cat. C1** | 0.15 | 0.357 | 0.152 | 0.359 | 0.148 | 0.355 |
| **Socioeconomic Cat. C2** | 0.25 | 0.433 | 0.333 | 0.471 | 0.171 | 0.376 |
| **Socioeconomic Cat. D** | 0.173 | 0.379 | 0.179 | 0.383 | 0.169 | 0.375 |
| **Socioeconomic Cat. E** | 0.306 | 0.461 | 0.207 | 0.405 | 0.402 | 0.491 |
| **Not Working / Housewife** | 0.314 | 0.464 | 0.59 | 0.492 | 0.049 | 0.216 |
| **Observations** | 2000 | 2000 | 980 | 980 | 1020 | 1020 |

# Gender Differences in Body Mass Index (BMI), Overweight and Obesity

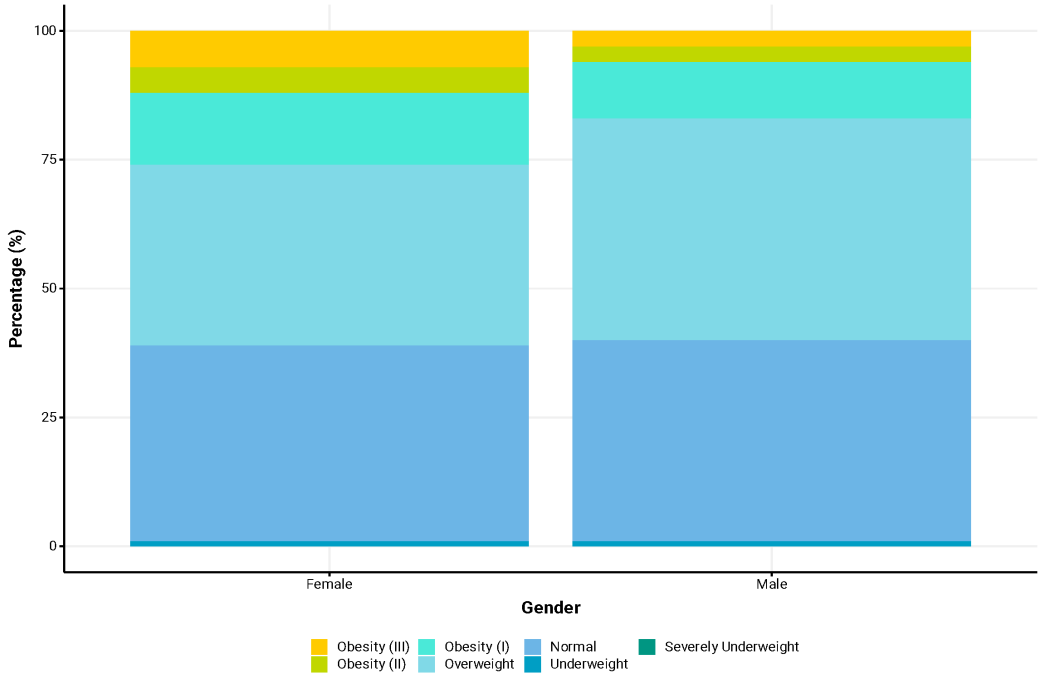
To analyse the gender-disparity in overweight using the survey-sample, we construct a histogram of BMI split by gender. Figure 1 depicts the distribution of individuals with unhealthy weights. We note there is a higher share of women who are overweight or obese (a BMI over 25). Next, we further decompose BMI of men and women.[34] Figure 2 highlights that, while the average BMI is considerably higher for women than for men, the proportion of individuals having a BMI within the normal range is relatively similar across genders. However, looking at overweight and obesity, we find that there is a significantly higher share of obese women than obese men (who instead are more likely to be overweight), suggesting a large obesity gap consistent with other studies. Intriguingly, while obese men are primarily Type I (30 < BMI < 35), there are a significant share of women that are type II (35 < BMI < 40) and type III (BMI > 40), namely morbidly obese women. This suggests evidence of important differences at the upper tail of the BMI distribution.

Figure 1: BMI separated by Female (Green) and Male (Yellow), annotated with Mean BMI




[34] A BMI of less than 16.5 implies severe underweight, a BMI between 16.5 and 18.5 implies underweight, a BMI between 18.5 and 25 implies normal weight, a BMI between 25 and 30 implies overweight, a BMI between 30 and 35 implies obesity class I, a BMI between 35 and 40 implies obesity class II, and a BMI over 40 implies obesity class III.

Figure 2: Weight Classification by Gender



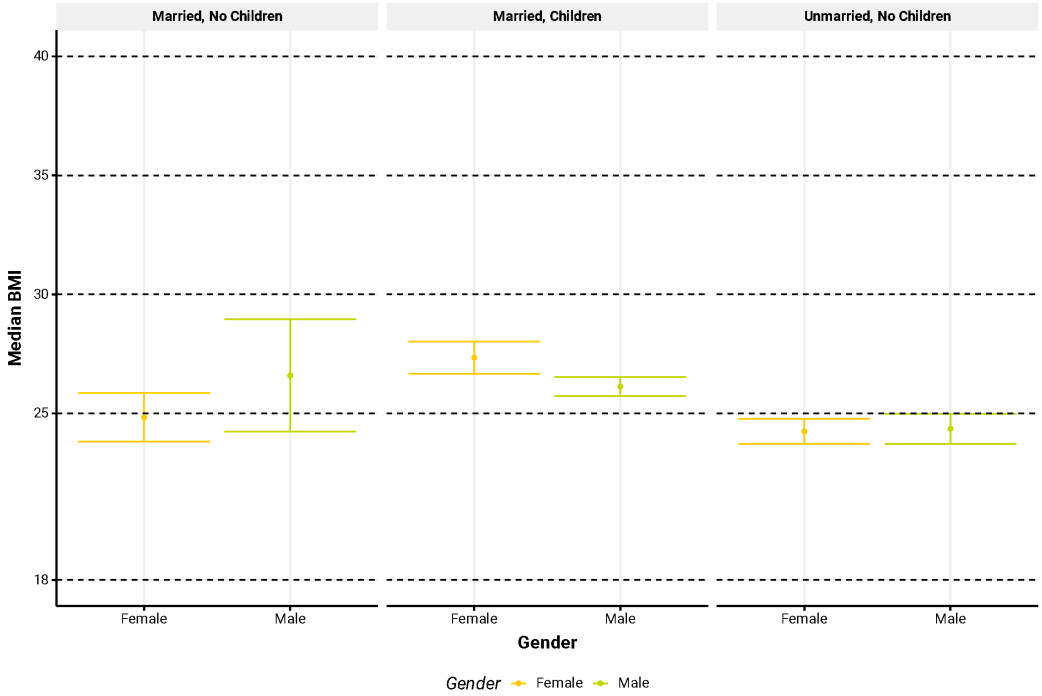
# Demographic Correlates of Gender Gaps in Overweight

## Marriage and Presence of Children

To clarify the demographic factors contributing to the obesity gender gap, we examine the differences in marital status and parenthood among men and women. One important difference between men and women in Egypt is apparent from the sample characteristics described earlier, suggesting that the probability of marriage and parenthood differs by gender. These factors are influential as marriage can reinforce traditional gender roles that in some circumstances can limit the opportunities for women to engage in activities encompassing calorie use. They are as a result more likely to stay in their homes as they are the primary caregivers of their children.

Figure 3 displays the mean BMI for men and women belonging to 3 sub-groups, married with children, married without children, and unmarried without children.[35] The figure shows how the existence of children is a significant contributing factor in explaining the gender BMI gap. More specifically, we find evidence of a moderate gender gap in overweight between married men and married women with children.[36]

Figure 3: Median BMI by Gender, Split into 3 Sub-Groups



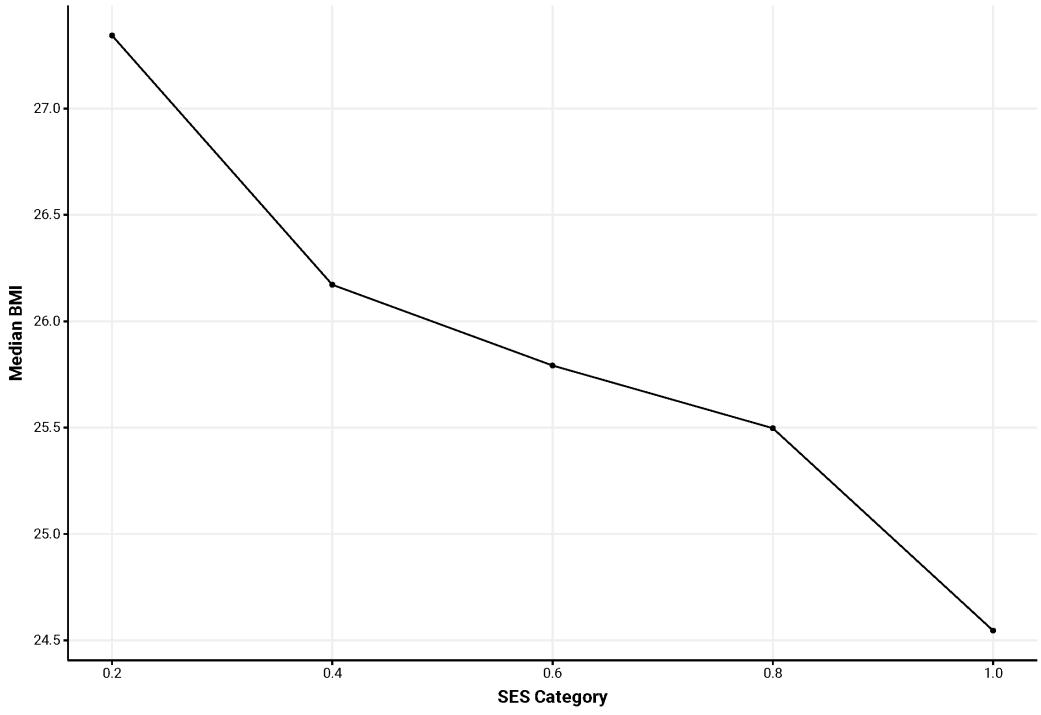

[35] There were no unmarried individuals with children in our survey sample.

[36] As this graph considers the median BMI, it is on the conservative side. If we instead look at mean BMI we find a significant gender gap in overweight between married men and married women with children.

## Overweight, Obesity and BMI across Socio-Economic Status

Prior research has found evidence of a clear inverse association between overweight and income in many Western countries,[37] and some evidence that an income transfer can reduce overweight,[38] especially among time-poor and lower SES individuals. However, in low and middle-income countries (LMICs), the effect of socio-economic status on overweight and obesity is ambiguous. On the one hand, overweight is often seen as a status symbol, particularly in rural areas where overweight might signal wealth and abundance in an environment of scarcity. Given the Westernisation of Egyptian culture, especially among the middle and upper classes, it is conceivable that societal norms are shifting towards Western ideals, which idealise thin bodies and exhibit a similar distribution by income. Figure 4 shows the median BMI for each household income quintile.[39] The data shows a clear divergence between the highest and lowest quintile. The top 20% income earners exhibit a median BMI that falls in the healthy weight range, while the bottom 20% is overweight with a median BMI above 27.

Figure 4: Median BMI by Income Quintile



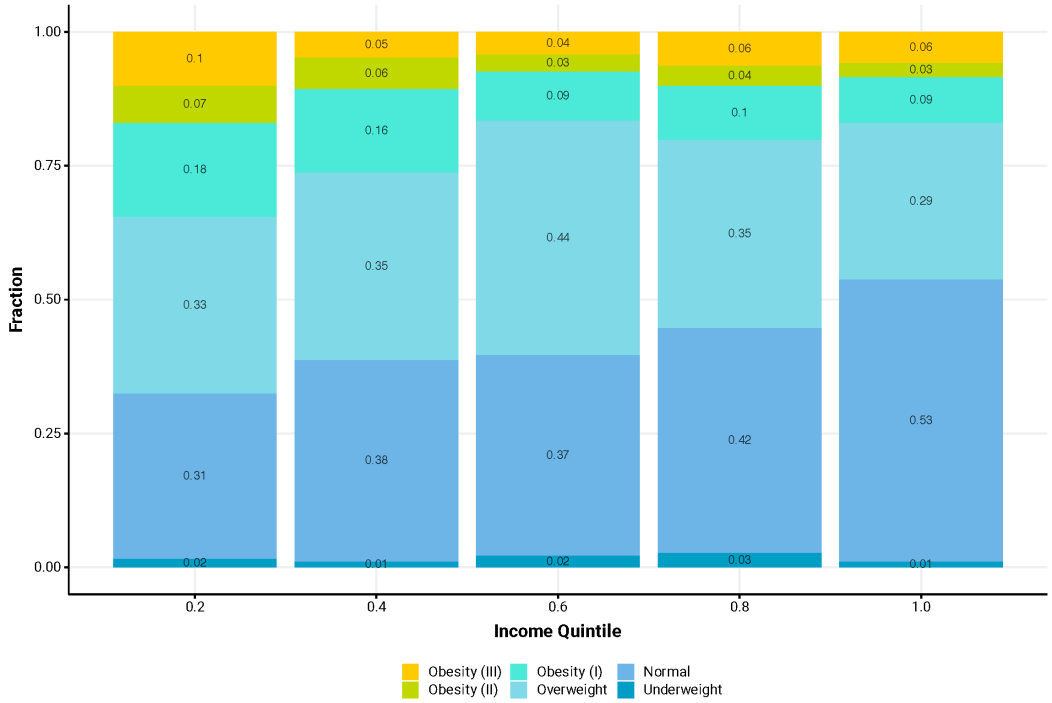

[37] Joan Costa-Font and Joan Gil, 'What Lies Behind Socio-Economic Inequalities in Obesity in Spain? A Decomposition Approach', *Food Policy* 33/1 (2008), pp. 61–73.

[38] Joan Costa-Font and Mario Györi, 'Income Windfalls and Overweight: Evidence from Lottery Wins', *Empirical Economics* 64/5 (2023), pp. 2005–26.

[39] Household Income is missing for 53% of the sample, which is why we later opt to use socio-economic score when constructing a PCA for socio-economic status instead of income. However, using socio-economic score yields the same descriptive results as income.

Figure 5 additionally displays the proportion of individuals in each weight category according to their income quintile. Whilst 53% of the highest income earners exhibit normal weight, only 31% do so among the lowest income earners. Interestingly, this seems to be driven by a significantly larger fraction of obese individuals among the lowest earners, as the fraction of overweight is similar in the bottom and top 20%. Figure 5 shows a strikingly large share of individuals who would be classified as having a medical unhealthy weight – from between 47–69% depending on income category.

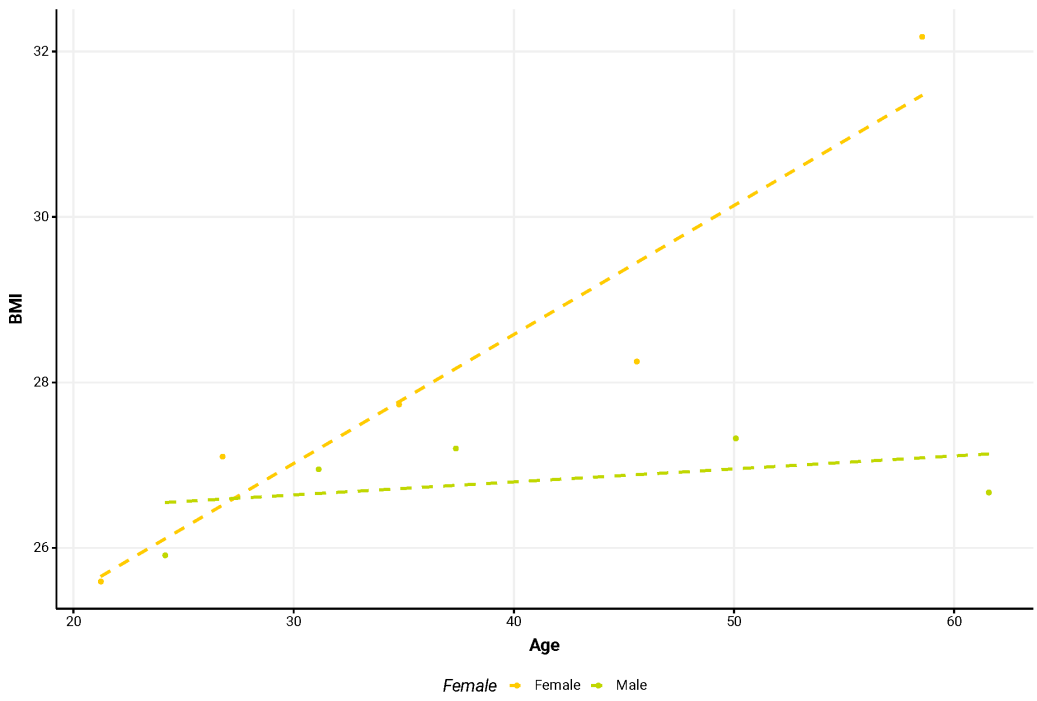
Figure 5: Proportion of Each Weight Classification Split by Income



## BMI Across Age Groups

Another important difference in BMI is the age of age an individual. Figure 6 displays the association between age and BMI by gender by constructing a binscatter of quintiles. The figure suggests a clear positive association between age and BMI for both men and women. Interestingly, there is little to no gender gap among the youngest quintiles, while such BMI gap is pronounced among the older quintiles. One explanation is that childless individuals maintain consistent, healthy BMI levels, as unhealthy BMI levels arise following marriage and the onset of parenthood. Another explanation lies in the role of generational shifts in BMI, reflecting changing social norms, alongside changes throughout the life cycle, possibly indicating biological and lifestyle changes as people age. However, the cross-sectional nature of the data prevents us from identifying one effect over the other. Additionally, the absence of a gender gap among the youngest decile could indicate the presence of adiposity-aversion among younger Egyptian women, perhaps due to the differing societal and cultural values compared to older generations, with the younger individuals being more likely to follow a Westernised ideal of a thin body, in contrast to their elders who might equate a heavier weight with health, maternal aptitude, or (for men) with prosperity and strength.

Figure 6: Association of BMI (Body Mass Index) by Age and by Gender



## The Role of Various Social and Behavioural Factors

Next, we endeavour to examine various social and behavioural factors that affect weight. To this end, we group survey questions into four thematic groups: (i) Socio-economic status, (ii) dietary choices, (iii) exercise, and (iv) adiposity aversion (denoting a welfare loss associated with larger bodies). We use Principal Component Analysis (PCA) to identify a synthetic measure of each category from the survey questions by collapsing several questions from a given category into one common component that explains the largest share of variation.

Table 2 lists descriptive statistics for the included variables in each category, separated by gender. From each PCA, we keep the Principal Component (PC) with the largest share of variation explained, as this is the one most easy to interpret as an underlying measure of the concept we wish to study. To measure the socio-economic position of an individual, we make use of whether a person owns a car, whether they own appliances signifying high status (smart TV, laptop etc.), and whether they and the household head went to technical college or further.[40] The first PC explains over 60% of the variation and all factors load positively, suggesting that this indeed captures socio-economic status. Analysing dietary behaviour, the first PC explains 22% of the variation and all factors (which include measures of consumption of different food types) load positively, suggesting this dimension alone captures an individual's overall consumption of food. The first PC for adiposity aversion explains about 68% of the total variation and all factors (questions on whether plumpness is beautiful, signifies affluence, and health) load positively, suggesting some level of idealisation for plumpness (and a negative estimate hence suggests evidence of adiposity aversion).

Finally, to capture exercise habits, we analyse factors such as how many hours individuals conducted heavy, moderate and light exercise. The first PC explains 25% of the variation, and the factors measuring heavy and moderate exercise load positively, while those measuring light exercise load negatively, suggesting this captures the degree to which the individual is physically active. Table 2 reports further details of the included factors.

[40] Reassuringly, incorporating other variables which may signify socio-economic status, such as occupation, yields similar results.

Table 2: Descriptive Statistics Used in A Principal Component Analysis (PCA)

| | General Sample | | Female Only | | Male Only | |
|---|---|---|---|---|---|---|
| | (1) Mean | (2) SD | (3) Mean | (4) SD | (5) Mean | (6) SD |
| **PCA: Socioeconomic Status** | | | | | | |
| Own Car | 0.461 | 0.499 | 0.505 | 0.5 | 0.419 | 0.494 |
| University Educ | 0.569 | 0.495 | 0.667 | 0.471 | 0.475 | 0.5 |
| Household Head University Educ | 0.562 | 0.496 | 0.659 | 0.474 | 0.47 | 0.499 |
| Live Upper-Middle Class Area | 0.501 | 0.5 | 0.582 | 0.494 | 0.424 | 0.494 |
| Phone | 0.675 | 0.468 | 0.754 | 0.431 | 0.6 | 0.49 |
| Aircon | 0.324 | 0.468 | 0.385 | 0.487 | 0.265 | 0.441 |
| Internet | 0.652 | 0.476 | 0.752 | 0.432 | 0.557 | 0.497 |
| Microwave | 0.55 | 0.498 | 0.632 | 0.483 | 0.473 | 0.499 |
| Water Dispenser | 0.473 | 0.499 | 0.544 | 0.498 | 0.405 | 0.491 |
| Dishwasher | 0.345 | 0.475 | 0.402 | 0.491 | 0.29 | 0.454 |
| Laptop | 0.512 | 0.5 | 0.597 | 0.491 | 0.431 | 0.496 |
| Video Game Console | 0.447 | 0.497 | 0.513 | 0.5 | 0.382 | 0.486 |
| Smart TV | 0.557 | 0.497 | 0.664 | 0.472 | 0.454 | 0.498 |
| PC1 Socioeconomic | 0 | 2.809 | 0.578 | 2.612 | -0.555 | 2.879 |
| **PCA: Food** | | | | | | |
| Fat Food Daily | 0.202 | 0.402 | 0.158 | 0.365 | 0.244 | 0.43 |
| Sugary Food Daily | 0.12 | 0.326 | 0.116 | 0.321 | 0.125 | 0.33 |
| Salty Food Daily | 0.453 | 0.498 | 0.478 | 0.5 | 0.429 | 0.495 |
| Fruit Consumption | 1.522 | 0.833 | 1.622 | 0.857 | 1.425 | 0.798 |
| Vegetable Consumption | 1.438 | 1.134 | 1.426 | 1.097 | 1.449 | 1.169 |
| Wheat Consumption | 1.988 | 0.856 | 1.819 | 0.786 | 2.149 | 0.889 |
| PC1 Food | 0 | 1.158 | -0.087 | 1.111 | 0.084 | 1.197 |
| **PCA: Exercice** | | | | | | |
| Hours Heavy Exercise | 0.255 | 1.006 | 0.116 | 0.702 | 0.387 | 1.214 |
| Last Week Hours Heavy Exercise | 0.14 | 0.77 | 0.058 | 0.499 | 0.219 | 0.954 |
| Hours Medium Exercise | 0.342 | 1.296 | 0.298 | 1.072 | 0.384 | 1.48 |
| Last Week Hours Medium Exercise | 0.343 | 1.208 | 0.378 | 1.238 | 0.309 | 1.178 |
| Hours Light Exercise | 0.847 | 2.033 | 1.102 | 2.223 | 0.602 | 1.801 |
| Last Week Hours Light Exercise | 0.761 | 2.476 | 1.04 | 3.175 | 0.494 | 1.484 |
| PC1 Exercise | 0 | 1.219 | -0.238 | 1.073 | 0.228 | 1.305 |
| **PCA: Plump** | | | | | | |
| Plump Beauty | 0.394 | 0.489 | 0.427 | 0.495 | 0.362 | 0.481 |
| Plump Healthy | 0.264 | 0.441 | 0.222 | 0.416 | 0.304 | 0.46 |
| Plump Affluence | 0.217 | 0.413 | 0.187 | 0.39 | 0.247 | 0.432 |
| PC1 Plump | 0 | 1.43 | -0.062 | 1.36 | 0.06 | 1.492 |
| Observations | 2000 | 2000 | 980 | 980 | 1020 | 1020 |

Once the different principal components have been identified, we then seek to decompose the effect of these on BMI. Hence, we run the following specification:

$$bmi_i = \alpha_r + \alpha_a + \chi_i'\beta + \gamma gender_i + \varepsilon_i$$

Where $\alpha_a$ $\alpha_r$ are age-interval and region fixed effects, and $\chi_i$ is a vector of Principal Components capturing the characteristics of interests.

Table 3: Effect of Each Principal Component Dimension (Socio-economic status, Diet, Plumpness and Exercise) on BMI

| | $BMI_i$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| **SEC PC** | -0.292*** [0.059] | | | | -0.286*** [0.059] |
| **Diet PC** | | 0.264 [0.216] | | | 0.302 [0.215] |
| **Plump PC** | | | -0.102 [0.113] | | -0.109 [0.113] |
| **Exercise PC** | | | | -0.544*** [0.122] | -0.508*** [0.121] |
| **Observations** | 2000 | 2000 | 2000 | 2000 | 2000 |
| **Adjusted R2** | 0.02 | 0.008 | 0.007 | 0.015 | 0.029 |
| **Gender Control** | Yes | Yes | Yes | Yes | Yes |
| **Age FE** | Yes | Yes | Yes | Yes | Yes |
| **Region FE** | Yes | Yes | Yes | Yes | Yes |

Table 3 displays in columns (1) to (4) the regression estimates of each factor on BMI, while in column (5) we include all factors together, as they are likely correlated amongst themselves. As expected, the PC capturing socioeconomic status is negatively associated with BMI. The diet PC is positively associated with BMI, which is expected as consuming more food (and more fatty and sugary food) should contribute to a higher BMI. However, the estimate is not statistically significant. We document adiposity aversion, namely a positive attitude towards plumpness to be negatively associated with BMI, although it is statistically insignificant. As expected, more exercise is negatively associated with BMI. To ensure that these effects are not being driven by people with lower BMI, we define an indicator taking on 1 if the individual's BMI is above 30 (so their weight classification is either Obesity I, Obesity II, or Obesity III), and 0 otherwise. Table 4 displays the estimates, and reassuringly we identify a consistent pattern with that of Table 3.

Table 4: Effect of Each Principal Component Dimension (Socio-economic status, Diet, Plumpness and Exercise) on BMI

| | $Obese_i$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| **SEC PC1** | -0.021*** [0.003] | | | | -0.021*** [0.003] |
| **Diet PC1** | | 0.011 [0.008] | | | 0.014* [0.008] |
| **Plump PC1** | | | -0.010 [0.006] | | -0.010* [0.006] |
| **Exercise PC1** | | | | -0.025*** [0.007] | -0.022*** [0.007] |
| **Observations** | 2000 | 2000 | 2000 | 2000 | 2000 |
| **Adjusted R2** | 0.02 | 0.008 | 0.007 | 0.015 | 0.029 |
| **Gender Control** | Yes | Yes | Yes | Yes | Yes |
| **Age FE** | Yes | Yes | Yes | Yes | Yes |
| **Region FE** | Yes | Yes | Yes | Yes | Yes |

# Conclusion

This project has studied the role of different behavioural and socio-economic explanations for the gender differences in overweight and obesity in Egypt. We draw on extensive survey evidence that includes about 2000 individuals from which we have been able to identify several socio-economic, cultural, and behavioural correlates of BMI. Our analysis shows, as expected, evidence of a clear gender gap in BMI, driven by the larger share of women that are obese. Furthermore, we show such a gap in BMI is primarily coming from married women with children that are older, and at the lower end of the socio-economic status distribution.

Additionally, our survey data allows us to examine several behavioural and social factors that can explain BMI, and we use principal component analysis (PCA) to collapse each factor into synthetic behavioural constructs of 'socio-economic status', 'diet', 'physical activity' and 'adiposity aversion'. We then use these factors in a regression analysis to determine which components are associated with BMI and obesity. Our estimates suggest some evidence of the role of differences in socioeconomic status and physical activity in explaining BMI, and suggest a less precise effect of adiposity aversion and diet. Our findings suggest that levels of sedentarism in the country can explain obesity and body-mass-index differences across individuals. These results are consistent with the idea that the differences in obesity by women and men previously attributed to labour market participation, are in fact driven by physical activity. Furthermore, they suggest that policy should be directed towards increasing levels of physical activity among women in the country, as well as reducing differences in socio-economic status, including education and budget constraints that are especially salient barriers for women.

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Local communities assemble long tables on the streets for iftar during Ramadan in Egypt. Source: Claudia Wiens / Alamy Stock Photo.

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