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FACULTY OF MEDICINE

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Comparative study of lifestyle factors affecting health of indigenous Greek and economic immigrants' preschool children in our country

Συγκριτική μελέτη παραγόντων τρόπου ζωής που επηρεάζουν τον τομέα της υγείας παιδιών προσχολικής ηλικίας γηγενών Ελλήνων και οικονομικών μεταναστών στη χώρα μας

DOCTORAL THESIS
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by

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DECLARATION

I certify that this thesis is that of the author alone; the work has not been submitted previously, in whole or in part. The content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

Maria K. Chrissini

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ABSTRACT

Childhood overweight and obesity is a growing public health problem worldwide, especially in countries undergoing severe financial and/or social reforms; including Greece. Increased immigration, lower socio-economic status, changes in food type, overconsumption of high fat and protein goods, pre-prepared and fast foods, low intake of fiber and increased intake of sugar and sweetened drinks, as well as a decline in physical activity, with high exposure on screen-based and sedentary leisure activities outline the main changes of modern multicultural world; leading to obesity and overweight even in under 5 years old children.

It is within this background that the current cross-sectional study has been conceptualized, aiming to assess Greek and immigrant preschoolers and their families regarding Body Mass Index (BMI), nutritional habits and adherence to the Mediterranean Diet, during the Greek austerity period, as well as to investigate the parental dietary and lifestyle trajectories that most strongly predict and determine native Greek and immigrant preschoolers' BMI and KIDMED score. Moreover, current levels of vigorous physical activity (outdoor play, sports participation, active transport to/from school) or sedentary behaviors (television viewing, video/DVD and computer game use) among native and immigrant preschoolers in Attica region were investigated and compared.

The cross-sectional study was performed in Attica, Greece, during the school year 2016-2017. A total sample of 578 guardian parents and 578 preschoolers (5-6 year-old), both native Greeks (n=451) and other nationalities (n=127), from a geographically representative sample of 63 public kindergartens, in 36 municipalities within Attica region, randomly selected, were enrolled in the study.

The Food Frequency Questionnaire (FFQ) and the KIDMED score were utilized as main tools, to assess dietary habits and adherence to the Mediterranean Diet, while other collected information included; parental demographic profile, parents' and children's BMI and lifestyle. The Physical Activity Questionnaire in preschoolers (developed by Rhea study and tested in Greek settings) was, also, utilized to assess PA status, both vigorous PA and sedentary behavior, along with core related lifestyle behaviors and habits.

Summarizing the results in one sentence, family's nutritional pattern, lifestyle choices and cultural particularities seem to determine child's behaviors, BMI, KIDMED Score and Physical Activity participation levels, with ethnicity playing role, both in familial dietary and lifestyle habits of Greeks and other ethnicity preschoolers and their guardian parents.

In particular, no significant differences were observed in BMI rates between Greeks and non-indigenous guardian parents; mean BMI was 24.9 (13.2) in Greeks and 24.8 (4.5) in other nationalities (between limits of normal and overweight). Significant, however, weight gains in immigrant parents upon permanent stay in Greece were reported. Statistically significant variations in lifestyle habits including Greek parents' heavier smoking and other ethnicity guardian parents' higher physical activity were depicted. Poor levels of adherence to the Mediterranean diet were observed in all preschoolers, while factors positively associated with child's BMI were: guardian parent's age and BMI, guardian parent's smoking status and alcohol consumption. Guardian parent's, child's physical activity and child's KIDMED score were protective factors, pointing out that family's lifestyle seems to strongly impact on preschoolers' dietary habits and BMI, regardless ethnicity.

Significantly high level of concordance of guardian parents' and preschoolers' dietary habits was revealed. The following dietary and lifestyle characteristics of (both Greek and other nationalities) parents' found to be the strongest predictors significantly increasing BMI in preschoolers: Low levels of KIDMED score, low frequency of removing fat from meat prior eating, low parental frequency of following Mediterranean Diet. Contrariwise, family's breakfast and brunch consumption, high frequency of consuming vegetables or fruits, as well as physically active parents who control preschoolers' diet, were predictors of diminishing the risk for high BMI in children. Child's increased physical activity and parents' frequency of following the Mediterranean Diet were found to decrease the risk for low KIDMED score in preschoolers.

Focusing on preschoolers' obesity and dietary differences between the two nationality groups, children's BMI didn't vary since it was 15.7 and 15.8 (normal/healthy weight) in Greeks and those of other nationalities, respectively. Similarly, KIDMED score was "poor" in the majority of both groups (p value=0.7). Nevertheless, several differences were observed in the sub-categories of KIDMED score measuring Mediterranean diet habits. In particular, more children

of other nationalities consume fish regularly (p value=0.04) and visit more than once per week a food restaurant, comparing to Greek children (p value<0.001). Furthermore, the 70.9% of the children of other nationality consumes pasta or rice almost every day (p value<0.001), the 80.2% of them have cereals or grains for breakfast (p value=0.02). Significantly less (p value<0.001) Greek children skip breakfast (10.9%) comparing to other nationalities (29.4%), whereas more Greeks use olive oil at home (Greek: 99.6%, other nationalities: 94.5%, p value<0.001). In addition, the 18.4% of other nationalities chooses commercially baked goods or pastries for breakfast (Greek: 9.1%, p value=0.003) and the 37% takes two yoghurts and/or 40g cheese daily (Greek: 50.2%, p value=0.008).

Frequency of physical activity was inversely correlated to body mass index, indicating that the less they exercise the more body mass index rises in both ethnic groups. Physical activity was found to be an independent indicator of increased body mass index, but some particular habits tended to increase risk of high body mass index in preschoolers; Such as TV watching daily and in weekends, mother's time spending in watching TV or using the computer and parent's attempting to provide food even when the child is not hungry.

Additionally, current levels of vigorous physical activity (outdoor play, sports participation, active transport to/from school) or sedentary behaviors (television viewing, video/DVD and computer game use) among native and immigrant preschoolers in Attica region were described and found to vary partially between Greek and other ethnic groups. Preschoolers of other ethnicity tended to watch TV more hours daily comparing to Greek (p<0.001), and during weekends (p <0.001).

Nevertheless, duration of playing basketball in the kindergarten's yard was also found to vary significantly (p=0.03) in favor of those of other ethnicity (mean=20.3 minutes/day vs 14.8 minutes/day in Greeks). Similarly, they played more (p=0.04) both in actively and sedentary position in the kindergarten (mean=59.5 minutes/day vs 48.4 minutes/day in Greeks). The majority of Greek preschoolers, on the other hand, tend to play in the playgrounds (56.7% vs 38.1% in other ethnicities, p<0.001) and have several scheduled afternoon activities (74.1% vs 40.2% in other ethnicities, p<0.001).

Greek preschoolers seemed to have more intense PA during summer as well (e.g. swimming, $p<0.001$) playing at the sand, $p=0.02$), as well as frequent skating ($p=0.02$). Still they reported less frequently that they went for calm or intense walk with their parents (88.2% in other ethnicity vs 66.1% in Greeks).

Furthermore, the vast majority of parents of Greek preschoolers reported that spent almost no personal time to facilitate child's physical activity (mothers: 41.4%; fathers: 39.9%). Although slightly lower proportions were reported by the other ethnicities (mothers: 39.2%; fathers: 35.8%) in "almost no time" response, more of them tend to offer at least ½ hour/week (mothers: 11.2%; fathers:17.5%) or 1 hour/week (mothers: 12.8%; fathers: 13.3%) and more than 7 hours/week (mothers: 6.4%; fathers: 6.6%).

As family's lifestyle appears to have a strong impact on dietary habits and the Mass Index, regardless of ethnicity, the determination of dietary patterns in preschool can be a reliable indicator for monitoring the epidemic of obesity at an early age. Families should be encouraged to promote optimal eating habits to achieve better health outcomes for their children.

Keywords: Preschoolers, Immigrants, Ethnicity, Socioeconomic Status, Inequalities, Lifestyle, Dietary indices, Dietary patterns, Nutrition, Family Meals, Mediterranean Diet, Obesity, Body Mass Index, KIDMED Score, Parental influences**,** Physical Activity, Vigorous Activity, Sedentary Behavior, Sports, Outdoor play, TV viewing.

ΠΕΡΙΛΗΨΗ

Η παιδική παχυσαρκία και η εμφάνιση υπερβολικού βάρους στα παιδιά, από την πρώιμη παιδική ηλικία, αποτελεί ένα παγκόσμιο αυξανόμενο πρόβλημα δημόσιας υγείας, ειδικά σε χώρες που υφίστανται σοβαρές κοινωνικο-οικονομικές μεταρρυθμίσεις. συμπεριλαμβανομένης της Ελλάδας. Παράγοντες όπως η αυξημένη μετανάστευση, η συνακόλουθη χαμηλότερη κοινωνικοοικονομική κατάσταση, οι αλλαγές στον τύπο των τροφίμων, η υπερκατανάλωση προϊόντων υψηλής περιεκτικότητας σε λιπαρά και πρωτεΐνες, προπαρασκευασμένων και γρήγορων τροφίμων, η χαμηλή πρόσληψη ινών και η αυξημένη πρόσληψη ζάχαρης και γλυκαντικών ποτών, καθώς και η παράλληλη μείωση της σωματικής άσκησης και δραστηριότητας, η υψηλή έκθεση σε δραστηριότητες αναψυχής που βασίζονται στην παρακολούθηση τηλεοπτικών εκπομπών και καθιστικές δραστηριότητες, αναδεικνύουν τις κύριες αλλαγές του σύγχρονου πολυπολιτισμικού κόσμου που οδηγούν στο φαινόμενο να είναι παχύσαρκα και υπέρβαρα παιδιά ακόμη και κάτω των 5 ετών.

Στο πλαίσιο του παραπάνω προβληματισμού σχεδιάστηκε η τρέχουσα συγχρονική μελέτη, κατά την περίοδο της Ελληνικής οικονομικής κρίσης, με στόχο την εκτίμηση του Δείκτη Μάζας Σώματος (BMI) των Ελλήνων και αλλοδαπών νηπίων και της οικογένειάς τους, των διατροφικών τους συνηθειών, την εκτίμηση του βαθμού υιοθέτησης ή μη του προτύπου της Μεσογειακής Διατροφής. Στόχος, επίσης, της μελέτης αυτής υπήρξε η διερεύνηση των διατροφικών συνηθειών γονέων και νηπίων, Ελλήνων και μη, οι οποίες δρουν καθοριστικά (προστατευτικά ή επιβαρυντικά) ως προς το Δείκτη Μάζας Σώματος (BMI) και το KIDMED σκορ των νηπίων, ανεξαρτήτως προέλευσης.

Επιπλέον, η παρούσα μελέτη είχε ως στόχο να διερευνηθούν και να συγκριθούν τα επίπεδα έντονης φυσικής δραστηριότητας (υπαίθρια παιχνίδια, συμμετοχή σε αθλήματα, ενεργή μεταφορά από / προς το σχολείο) ή καθιστικής συμπεριφοράς (παρακολούθηση τηλεόρασης, βίντεο / DVD και χρήση ηλεκτρονικών παιχνιδιών) σε παιδιά προσχολικής ηλικίας Ελλήνων και μεταναστών στην Αττική.

Η συγχρονική αυτή μελέτη πραγματοποιήθηκε στην Αττική κατά τη διάρκεια του σχολικού έτους 2016-2017. Δείγμα της μελέτης αποτέλεσαν 578 νήπια (5-6 ετών) και 578

γονείς/κηδεμόνες, Έλληνες (n = 451) και άλλων εθνικοτήτων (n = 127).Ένα γεωγραφικά αντιπροσωπευτικό δείγμα 63 Δημόσιων Νηπιαγωγείων σε 36 δήμους/κοινότητες της Αττικής επιλέχθηκε τυχαία από σχετική λίστα σχολείων του Υπουργείου Παιδείας, Έρευνας και Θρησκευμάτων.

Το Ερωτηματολόγιο Συχνότητας Τροφίμων (Food Frequency Questionnaire / FFQ) και το KIDMED Score χρησιμοποιήθηκαν ως βασικά ερευνητικά εργαλεία διερεύνησης των διατροφικών συνηθειών των παιδιών και του επιπέδου προσκόλλησης τους στο πρότυπο της Μεσογειακής Διατροφής, ενώ συλλέχθηκαν πληροφορίες σχετικά με το δημογραφικό προφίλ των γονέων, τον τρόπο ζωής και τον Δείκτη Μάζας Σώματος γονέων και νηπίων. Το ερωτηματολόγιο σωματικής άσκησης στα παιδιά προσχολικής ηλικίας (το οποίο σχεδιάστηκε στα πλαίσια της μελέτης Rhea και δοκιμάστηκε σε ελληνικά περιβάλλοντα) χρησιμοποιήθηκε, επίσης, για την αξιολόγηση της φυσικής κατάστασης, άσκησης και δραστηριότητας (Physical Activity), τόσο της έντονης φυσικής κατάστασης / δραστηριότητας, όσο και της καθιστικής συμπεριφοράς, όσο και των συνακόλουθων συνηθειών του τρόπου ζωής, των νηπίων και των οικογενειών τους.

Συνοψίζοντας τα αποτελέσματα της μελέτης, στα πλαίσια της διδακτορικής διατριβής, σε μια πρόταση, το μοντέλο διατροφής της οικογένειας, οι επιλογές τρόπου ζωής και οι πολιτισμικές ιδιαιτερότητες φαίνεται να καθορίζουν τα επίπεδα διατροφικής συμπεριφοράς των παιδιών, τον Δείκτη Μάζας Σώματός τους, το KIDMEDScore, αλλά και τα επίπεδα σωματικής άσκησης, με τον παράγοντα της εθνικής καταγωγής, να διαδραματίζει ρόλο, τόσο στις οικογενειακές διατροφικές συνήθειες όσο και στις συνήθειες του ζωής των παιδιών προσχολικής ηλικίας και των γονέων τους.

Δεν παρατηρήθηκαν στατιστικά σημαντικά διαφορές στα ποσοστά Δείκτη Μάζας Σώματος (BMI), μεταξύ των γονέων Ελλήνων και αλλοδαπών (mean BMIήταν 24.9 (13.2) για τους Έλληνες γονείς και 24.8 (4.5) για τους γονείς άλλων εθνικοτήτων, στα όρια μεταξύ κανονικό βάρος/υπέρβαροι), παρά τη σημαντικά αναφερόμενη πρόσληψη βάρους των αλλοδαπών γονέων κατά τη διάρκεια της μόνιμης διαβίωσης τους στην Ελλάδα. (κατά προσέγγιση /Μ.Ο. 12 kg). Αναδείχθηκαν στατιστικά σημαντικές διαφορές στις συνήθειες του τρόπου ζωής, συγκεκριμένα υψηλότερα ποσοστά καπνίσματος των Ελλήνων γονέων και υψηλότερα

ποσοστά φυσικής άσκησης στους γονείς άλλων εθνοτήτων (p value<0.05). Οι παράγοντες που παρουσίασαν συσχέτιση με το Δείκτη Μάζας Σώματος των νηπίων ήταν: η ηλικία και ο Δείκτης Μάζας Σώματος της μητέρας, το επίπεδο καπνίσματος της μητέρας, καθώς και η κατανάλωση αλκοόλ. Η φυσική άσκηση μητέρας και παιδιού και το KIDMED score του παιδιού αναδείχθηκαν ως προστατευτικοί παράγοντες σε σχέση με το Δείκτη Μάζας Σώματος.

Τα αποτελέσματα της μελέτης μας ανέδειξαν στατιστικά σημαντικό ποσοστό συμφωνίας μεταξύ των διατροφικών συνηθειών γονέων/κηδεμόνων και νηπίων. Ως ισχυροί προγνωστικοί δείκτες που αυξάνουν σημαντικά το Δείκτη Μάζας Σώματος σε παιδιά προσχολικής ηλικίας (p value<0.05) ξεχώρισαν τα ακόλουθα χαρακτηριστικά διατροφής και τρόπου ζωής των γονέων, Ελλήνων και μη: χαμηλά επίπεδα KIDMED Score, χαμηλή συχνότητα αφαίρεσης του λίπους από το φαγητό, χαμηλή συχνότητα υιοθέτησης της Μεσογειακής Διατροφής από τους γονείς. Αντιθέτως, η κατανάλωση από την οικογένεια πρωινού και μεσημεριανού γεύματος, η υψηλή συχνότητα κατανάλωσης λαχανικών και φρούτων, καθώς και η ενεργή φυσική δραστηριότητα των γονέων, αλλά και ο διατροφικός έλεγχος των τελευταίων στα παιδιά, προέκυψαν ως προγνωστικοί δείκτες / παράγοντες μείωσης του κινδύνου εμφάνισης υψηλού Δείκτη Μάζας Σώματος των νηπίων. Τέλος, το αυξημένο ποσοστό άσκησης και φυσικής δραστηριότητας των νηπίων και η υιοθέτηση, από τους γονείς, της Μεσογειακής Διατροφής, έδειξαν μείωση του κινδύνου χαμηλού KIDMED Score στα νήπια, ανεξαρτήτως εθνικής προέλευσης.

Εστιάζοντας στην παχυσαρκία και τις διατροφικές διαφορές μεταξύ των νηπίων, Ελλήνων και μη, δεν ανιχνεύθηκε διαφορά στο ΔΜΣ των παιδιών δεν διέφερε και (15,7 στα νήπια από Ελλάδα και 15,8 στα νήπια άλλων εθνοτήτων αντίστοιχα, με κατανομή ανάμεσα στα όρια φυσιολογικό / υγιές βάρος. Ομοίως, η βαθμολογία KIDMED ήταν «φτωχή» στην πλειονότητα και των νηπίων και των δύο ομάδων (τιμή p = 0,7). Παρατηρήθηκαν, ωστόσο, αρκετές διαφορές στις υπο-κατηγορίες του KIDMED Score που μετρούν τις μεσογειακές διατροφικές συνήθειες των παιδιών. Συγκεκριμένα, περισσότερα παιδιά άλλων εθνικοτήτων καταναλώνουν τακτικά ψάρια (τιμή p = 0,04) και επισκέπτονται περισσότερες από μία φορές την εβδομάδα εστιατόριο τύπου fast food σε σύγκριση με τα νήπια ελληνικής καταγωγής (τιμή p <0,001). Επιπλέον, το 70,9% των νηπίων άλλης εθνικότητας καταναλώνει σχεδόν καθημερινά ζυμαρικά ή ρύζι (τιμή p <0,001), ενώ το 80,2% των νηπίων άλλης εθνικότητας καταναλώνει δημητριακά

ή ξηρούς καρπούς για πρωινό (τιμή p = 0,02). Επίσης, στατιστικά σημαντικά (p value<0.001) λιγότερα νήπια Ελλήνων δεν τρώνε πρωινό (10.9%), σε σχέση με τα νήπια άλλων εθνοτήτων (29.4%),ενώ περισσότερα παιδιά Ελληνικής καταγωγής χρησιμοποιούν ελαιόλαδο στο σπίτι (Έλληνες: 99,6%, άλλες εθνικότητες: 94,5%, τιμή p <0,001). Επιπλέον, ποσοστό 18,4% των νηπίων άλλων εθνικοτήτων επιλέγει για πρωινό στο σχολείο αρτοσκευάσματα του εμπορίου και γλυκά (Έλληνες: 9,1%, τιμή p = 0,003), ενώ διαφέρει, επίσης, η κατανάλωση γαλακτοκομικών προϊόντων μεταξύ των νηπίων Ελλήνων και άλλων εθνικοτήτων (37% των αλλοδαπών νηπίων καταναλώνει δύο γιαούρτια ή / και 40 γραμμάρια ημερησίως, συγκριτικά με αντίστοιχο ποσοστό Ελλήνων νηπίων 50.2%, p value=0.008).

Σύμφωνα με τα αποτελέσματα της μελέτης, η συχνότητα της σωματικής δραστηριότητας συσχετίζεται αντιστρόφως ανάλογα με τον Δείκτη Μάζας Σώματος, υποδεικνύοντας ότι όσο λιγότερο ασκούνται γονείς και παιδιά, τόσο περισσότερο αυξάνεται ο ΔΜΣ και στις δύο εθνοτικές ομάδες. Η φυσική άσκηση / δραστηριότητα αναδείχθηκε ως ένας ανεξάρτητος δείκτης αυξημένου Δείκτη Μάζας Σώματος, αλλά ορισμένες ιδιαίτερες συνήθειες τείνουν να αυξάνουν τον κίνδυνο εμφάνισης υψηλού ΔΜΣ στα παιδιά προσχολικής ηλικίας: η παρακολούθηση τηλεόρασης κατά τις καθημερινές και τα Σαββατοκύριακα, ο χρόνος που δαπανά μητέρα στην τηλεόραση ή στη χρήση υπολογιστή, αλλά και η προσπάθεια των γονέων να παρέχουν τροφή στο παιδί ακόμα και όταν αυτό δεν είναι πεινασμένο.

Επιπλέον, εξετάστηκαν τα επίπεδα έντονης σωματικής δραστηριότητας (υπαίθρια παιχνίδια, συμμετοχή σε αθλήματα, μεταφορά από / προς το σχολείο), επίπεδα συμμετοχής σε καθιστικές δραστηριότητες (παρακολούθηση τηλεόρασης, βίντεο / DVD και χρήση ηλεκτρονικών παιχνιδιών) σε παιδιά προσχολικής ηλικίας Ελλήνων και αλλοδαπών στην Αττική. Ανιχνεύθηκαν σημαντικές διαφορές ανάμεσα στις δυο ομάδες Ελλήνων και μη: τα νήπια άλλων εθνικοτήτων τείνουν να παρακολουθούν τηλεόραση περισσότερες ώρες καθημερινά συγκριτικά με τα νήπια Ελλήνων (p <0.001), και τα Σαββατοκύριακα (p <0.001).

Παρόλα αυτά, η διάρκεια του μπάσκετ στην αυλή του νηπιαγωγείου βρέθηκε επίσης να διαφέρει σημαντικά (p = 0,03) υπέρ των άλλων εθνοτήτων, συγκριτικά με τα νήπια Ελλήνων. Ομοίως, τα νήπια με καταγωγή από άλλες χώρες παίζουν περισσότερα (p = 0,04) τόσο σε ενεργές όσο και καθιστικές δραστηριότητες κατά τη διάρκεια του προγράμματος στο

νηπιαγωγείο, ενώ η πλειοψηφία των Ελλήνων νηπίων φαίνεται να παίζουν περισσότερο στις παιδικές χαρές (56,7% έναντι 38,1% σε άλλες εθνότητες, p <0,001) και έχουν σημαντικά περισσότερες προγραμματισμένες απογευματινές αθλητικές δραστηριότητες (74,1% έναντι 40,2% σε άλλες εθνότητες, p <0,001).

Ακόμη, τα νήπια των ελληνικών οικογενειών φαίνεται να δραστηριοποιούνται εντονότερα κατά τη διάρκεια του καλοκαιριού στη θάλασσα (π.χ. κολύμβηση, p <0,001, παίζοντας στην άμμο, p = 0,02). Η δραστηριότητα της ήρεμης ή έντονη βόλτας των παιδιών με τους γονείς τους, αναφέρθηκε λιγότερο στα νήπια Ελλήνων (66,1%), έναντι ποσοστού88,2% στα νήπια άλλης εθνικότητας.

Η συντριπτική πλειοψηφία των Ελλήνων γονέων ανέφερε, επίσης, ότι δεν αφιερώνει σχεδόν καθόλου προσωπικό χρόνο για να διευκολύνει τη σωματική άσκηση των παιδιών (μητέρες: 41,4% · πατέρες: 39,9%). Αν και η απάντηση "σχεδόν καθόλου", ήταν σε ελαφρώς χαμηλότερο ποσοστό στους αλλοδαπούς γονείς (μητέρες: 39,2%, πατέρες: 35,8%), οι περισσότεροι από τους αλλοδαπούς γονείς τείνουν να προσφέρουν τουλάχιστον ½ ώρα την εβδομάδα (μητέρες: 11,2%, πατέρες: 17,5 %) ή 1 ώρα εβδομαδιαίως (μητέρες: 12,8%, πατέρες: 13,3%) και περισσότερο από 7 ώρες την εβδομάδα σε χαμηλότερο ακόμη ποσοστό (μητέρες: 6,4% · πατέρες: 6,6%).

Καθώς ο τρόπος ζωής της οικογένειας φαίνεται να έχει ισχυρό αντίκτυπο στις διατροφικές συνήθειες και το Δείκτη Μάζας, ανεξαιρέτως εθνότητας, ο προσδιορισμός των διατροφικών προτύπων στην προσχολική ηλικία μπορεί να αποτελέσει αξιόπιστο δείκτη για την παρακολούθηση των επιδημικών φαινομένων παχυσαρκίας στις πρώιμες ηλικίες. Οι οικογένειες θα πρέπει να ενθαρρύνονται να προωθούν τις βέλτιστες διατροφικές συνήθειες προς επίτευξη καλύτερων αποτελεσμάτων υγείας για τα παιδιά τους.

ΛΕΞΕΙΣ – ΚΛΕΙΔΙΑ: Παιδιά Προσχολικής Ηλικίας, Μετανάστες, Εθνική Προέλευση, Κοινωνικοοικονομικό Επίπεδο, Τρόπος Ζωής, Διατροφικές Συνήθειες, Διατροφή, Οικογενειακά Γεύματα, Μεσογειακή Διατροφή, KIDMED Σκορ, Παχυσαρκία, Δείκτης Μάζας Σώματος, Γονικές Επιδράσεις, Φυσική Άσκηση, Έντονη Φυσική Δραστηριότητα, Καθιστική Συμπεριφορά, Σπόρ, Εξωτερικό Παιχνίδι, ΠαρακολούθησηΤηλεόραση

LIST OF ABBREVIATIONS

ANGELO	ANalysis Grid for Environments Linked to Obesity
BMI	Body Mass Index
CVD	Cardiovascular Disease
EBRB	Energy Balance-Related Behaviors
EnRG	Environmental Research Framework for weight Gain prevention
EST	Ecological Systems Theory
FBDG	Food-Based Dietary Guidelines
FFQ	Food Frequency Questionnaire
F&V	Fruits & Vegetables
HEI	Healthy Eating Index
IOTF	International Obesity Task Force
KIDMED	Mediterranean Diet Quality Index
L-VPA	Light to Vigorous (intensity) Physical Activities
MVPA	Moderate-to-Vigorous (Intensity) Physical Activity
MD	Mediterranean Diet
NASPE	National Association for Sport and Physical Education
OW/OB	Overweight/Obesity
PA	Physical Activity
PE	Physical Education
SB	Sedentary Behavior
SD	Standard Deviation
SE	Standard error
SEP	Socioeconomic Position
SES	Socioeconomic Status
SSB	Sugar-Sweetened Beverage
TV	Television
VPA	Vigorous (intensity) Physical Activity
WCT	Weight Control Treatments
WHO	World Health Organization

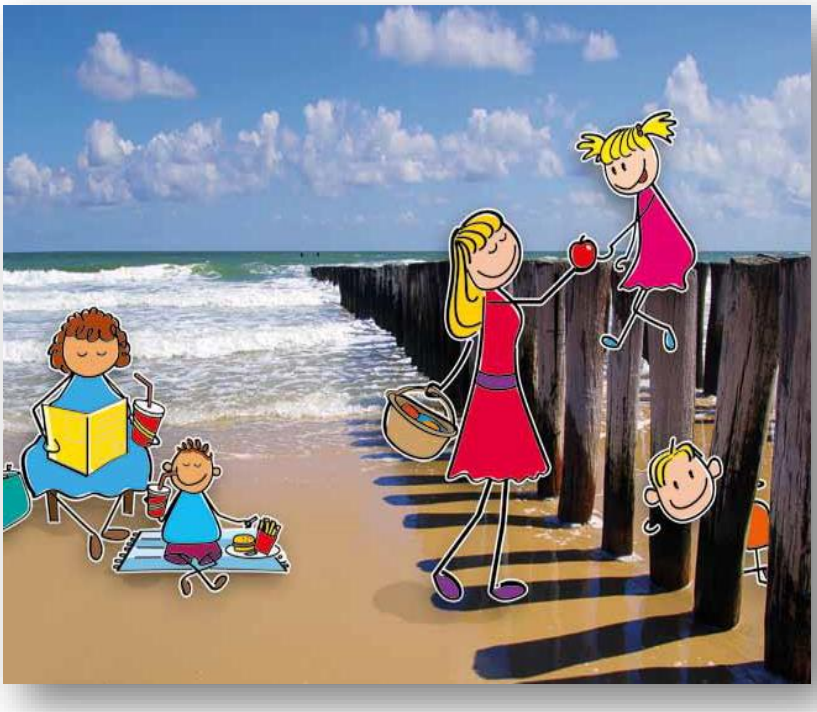
Definition of Key Terms and Concepts [1]

BMI	Body mass index = weight (kg)/height (m2).
BMI-FOR-AGE	BMI adjusted for age, standardized for children.
CHILDREN	Those less than 18 years of age (Convention on the rights of the child, Treaty Series, 1577:3(1989): PART I, Article 1 defines a child as every human being below the age of eighteen years unless, under the law applicable to the child, majority is attained earlier. The World Health Organization (WHO) defines adolescents as those between 10 and 19 years of age. The majority of adolescents are, therefore, included in the age-based definition of "child", adopted by the Convention on the Rights of the Child, as a person under the age of 18 years).
INFANTS	Those less than 12 months of age
YOUNG CHILDREN	Those less than 5 years of age.
HEALTHY FOODS	Foods that contribute to healthy diets if consumed in appropriate amounts. (http://www.who.int/mediacentre/factsheets/fs394/en/.)
UNHEALTHY FOODS	Foods high in saturated fats, trans-fatty acids, free sugars or salt (i.e. energy-dense, nutrient-poor foods).
OBESITY	***From birth to less than 5 years of age***: weight-for-height more than 3 Standard Deviation (SD) above the WHO Child Growth Standards median (http://www.who.int/childgrowth/standards/technical_report/en/) ***From age 5 to less than 19 years:*** BMI-for-age more than 2 SD above the WHO growth reference median. (http://www.who.int/nutrition/publications/growthref_who_bulletin/en/) The new curves are closely aligned with the WHO Child Growth Standards at 5 years, and the recommended adult cut-offs for overweight and obesity at 19 years. They fill the gap in growth curves and provide an appropriate reference for the 5–19-year age group).
OVERWEIGHT	***From birth to less than 5 years of age:*** weight-for-height more than 2 SD above WHO Child Growth Standards median. 3 (http://www.who.int/childgrowth/standards/technical_report/en/) ***From age 5 to less than 19 years:*** BMI-for-age more than 1 SD above WHO growth reference median. (http://www.who.int/nutrition/publications/growthref_who_bulletin/en/) The new curves are closely aligned with the WHO Child Growth Standards at 5 years, and the recommended adult cut-offs for overweight and obesity at 19 years. They fill the gap in growth curves and provide an appropriate reference for the 5–19-year age group).
OBESOGENIC ENVIRONMENT	An environment that promotes high energy intake and sedentary behavior. This includes the foods that are available, affordable, accessible and promoted; physical activity opportunities; and the social norms in relation to food and physical activity.

Chapter 1

Introduction Part 1

Main concepts of the study



CHAPTER 1: INTRODUCTION; PART 1:MAIN CONCEPTS OF THE STUDY

This chapter introduces a comparative, cross-sectional study of lifestyle factors determining health aspects and parameters of indigenous Greek and economic immigrant preschoolers' in Attica, Greece. It comprises the background and context of the study, statement of the problem, purpose and objectives, as well as the significance of the study. It also covers the research questions and hypothesis of the research study and definition of key terms. Personal and professional involvement in the study is also stated in the general introduction, along with the structure of the thesis.

1.1. BACKGROUND & CONTEXT OF THE STUDY

Although in high-income countries the increase in the prevalence of overweight and obesity among children seems to level off, the prevalence of excessive weight in children remains high and is higher in urban settings [2]. This difference is related to the relatively high number of families with a migration background and low socio-economic status in urban surroundings [3]. Even young children 3 to 4.5 years old show consequences of health inequalities, and these inequalities widen with increasing age [3]. The period between age 2 and 6 is fundamental for the development of adult overweight [4]. Overweight or obese children are more likely to become overweight or obese as adults, with a higher risk of developing non-communicable diseases and psychosocial impairments earlier in life[5].

Childhood overweight and obesity is a growing public health problem worldwide, especially in countries undergoing severe financial and/or social reforms; including Greece [6,7]. This alarming health issue is considered to be a major risk factor for several chronic diseases in child's later life, and should be further explored even in younger age groups [8]. Greek studies from 2007 to 2015 focusing on preschoolers report high percentage (21.2-23.2%) of overweight (including obesity) [9-12].

Dietary habits, nationality, cultural profile, socioeconomic status and physical activity, as well as familial and guardian parent's Body Mass Index (BMI) and lifestyle are some of the frequently

documented health related determinants of childhood obesity/overweight [8,13]. Particularly, increased immigration, lower socio-economic status, changes in food type, overconsumption of high fat and protein goods, pre-prepared and fast foods, low intake of fiber and increased intake of sugar and sweetened drinks, as well as a decline in physical activity, with high exposure on screen-based and sedentary leisure activities (e.g. internet and video games) outline the main changes of modern multicultural world; leading to obesity and overweight even in under 5 years old children [1]. Towards this direction, family's nutritional pattern, lifestyle choices and cultural particularities seem to determine child's behaviors, BMI and overall health assets [14]. These trends are even more evident in European countries with limited resources [9,10,15,16].

Nevertheless, there is a paucity of long-term epidemiological data regarding obesity status in early aged children (i.e. preschoolers) worldwide and mainly in European and Mediterranean countries undergoing societal and/or financial challenges [17]. Since 2009, Greece is one of the most representative countries having being affected by the social and financial crisis in Europe and has already reported significant adverse effects in public health[18]. Even among preschoolers obesity and lifestyle pattern seems to have changed[1]. To the best of our knowledge, the only Greek evidence is reported in the Genesis study that has revealed excess body weight in preschoolers (overweight prevalence =17.2%) [9]. Overweight prevalence in young children has increased even more during the austerity period in Greece (18.2%), while obesity reached the 7.4% [19]. Still, variations and differences among the different ethnicity or cultural groups in preschoolers have not been sufficiently reported in the Greek literature, although it is a country with many immigrants [8,20].

Contrary to that, the vast majority of European research on obesity and overweight in children is currently drawing attention to cultural comparison studies, exploring differences and similarities in food preferences, nutritional habits and health outcomes between children from ethnic minority groups; coming from the former Eastern Bloc countries, from Asia, India, Pakistan, Bangladesh and Africa [21,22].

Despite their socioeconomic disadvantages and healthcare accessibility barriers, those maintaining a satisfying overall health status are able to travel and reach host countries [23,24].

This is known as the “migrant paradox” phenomenon [25]. Nevertheless, upon permanent and long-term stay, intrinsic and environmental factors cause unhealthy weight gain, often beyond the levels seen in native populations [26]. Immigrant’s dietary habits seemed to approach some of the principles of the so called “Mediterranean diet-like pattern”, for which has been extensively highlighted that greater adherence is associated with significantly improved health status and lower risk of metabolic syndrome and chronic diseases [7,27].

Greece is among the developed countries with constantly increasing overweight and obesity rates, with mean prevalence in Greek preschoolers being approximately 23% [10,28]. Furthermore, other international studies have already recognized importance of this fact and have reported low levels of PA during school hours, high levels of sedentary time [29,30]and the potential devastating effects on child’s health and development [31,32]. Apart from body fat-related impact, PA contributes to other aspects of health, such as bone and skeletal health, cardiometabolic health, motor skill development, cognitive development and psychosocial health [33,34].

Although PA trends to vary between preschoolers of diverse ethnic groups [8,35], little is currently known [35]. Ethnic differences in prevalence of childhood and preschool overweight/obesity, BMI and PA have been extensively investigated in the USA, while European studies on this topic are scarce [36,37]. Further evidence on these trends and associations is essential, especially in countries of the Mediterranean region, that have increased rates of immigrants and increased overweight/obesity tendency [38].

The primary causes of overweight and obesity can be traced to energy balance-related behaviors (EBRBs) – dietary behaviors, physical activity, sedentary behavior, and sleep – which contribute to an energy imbalance between calorie intake and energy expenditure. A recent report from the WHO Commission on Ending Childhood Obesity[1] identifies obesogenic environments as the key driver for low levels of physical activity and high levels of sedentary behavior and intake of energy-dense foods. Obesogenic environments are characterized by physical and social–environmental features that encourage a sedentary lifestyle and offer ready availability of energy-dense, nutrient-poor food[1].

Physical activity is a key determinant of energy expenditure, as it has a fundamental positive influence on energy balance and weight control. Regular physical activity in children and adolescents is important for obesity prevention[39,40]and includes play, games, sports, transportation, housework, recreation, physical education and structured exercise and may be undertaken in the context of family, school or community activities. Physical activity levels, however, are generally very low in young people in all countries and are lower among girls. Time spent being physically active declines through adolescence. Young people spend approximately 60% of their waking time sitting, which makes sedentary behavior the most common behavior (besides sleep) in children and adolescents [41]. Screen time is also associated with acute eating behaviors such as snacking, but this is not sufficient to explain the detrimental associations between screen time and cardiometabolic health and obesity [42].

It is, thus, essential to develop effective strategies to reverse recent trends. The early years and important life transitions such as adolescence provide key opportunities to reinforce healthy trajectories that will also reap dividends later in life.

1.2. STATEMENT OF THE PROBLEM

1.2.1. What is known from the literature

Obesity among children and adolescents is a growing public, multifactorial health problem influenced by genetic, social, and economic environmental factors. Several studies have focused on the short- and long-term consequences of childhood obesity, and high body mass index (BMI) values have consistently been found to be associated with cardiovascular disease (CVD) risk factors such as insulin resistance, dyslipidemia, and increased blood pressure (BP) [43]. Recent findings from epidemiological studies support the increasing trend of obesity in Europe, with southern European countries such as Spain, Italy, Portugal, and Greece reporting a higher prevalence of obesity compared with northern European countries[44].

Still, it is worth mentioning the research findings of a recent (2015) Greek study performed in West Attica during 2009-2012, the years of Greek economic crisis, according to which a statistically significant reduction in overweight and obesity in children from 6 to 16 years old

was noticed during the initial years of the Greek financial crisis [45],probablyas a consequence of the rising proportion of Greek households that have been unable to afford the provision of meat, chicken or fish every second day to their children after the onset of the financial crisis and reforms plaguing Greece [18].

A Systematic (2016) Review, by Pereira-da-Silva et al. [46] revealed important data on the Diet of Preschool Children in the Mediterranean Countries of the European Union including the comparison with a Mediterranean-like diet and the association with preschoolers' nutritional status. According to the review, [46] young children -in the majority of countries- consumed fruit and vegetables quite frequently, but also consumed sugared beverages and snacks. High energy and high protein intakes mainly from dairy products were found in the majority of countries. The majority of children also consumed excessive sodium intake. Early high prevalence of overweight and obesity was found, and both early consumption of energy-dense foods and overweight seemed to track across toddler and preschool ages. Most children living in the analyzed countries showed low adherence to a Mediterranean-like diet, which in turn was associated with being overweight/obese. Unhealthier diets were associated with lower maternal educational level and parental unemployment.

Moreover, Physical activity (PA) and nutritional habits are amongst the core health behaviors that are silhouetted during preschool years, while they tend to affect several core obesity indicators; including body mass index (BMI) and KIDMED Score[36]. The 2011 World's Health Organization (WHO) estimation[47], highlighted that more than 42 million preschoolers are overweight, with most of them having low PA and high sedentary behavior[12,48]. Therefore, it is evident that this age group deserves prompt attention and monitoring these children prospectively to capture childhood and adult life health and clinical outcomes.

1.2.2. What we further need to learn.

Literature data concerning dietary and lifestyle parameters of preschoolers and their families, comparing to data on school-age children and adolescents, are scarce, and relevant data exploring ethnic differences in preschoolers' health trajectories even scarcer. Especially in

Greece, preschoolers and their families an understudied age group, especially after the onset of the financial crisis that has inserted a vast number of adverse health effects both in the native and non-indigenous population in Greece [49,50]. Although ethnic differences in childhood and adulthood are known, ethnic differences in preschool overweight and associated factors are less studied.

Available literature on BMI and dietary intakes mainly focuses on young children over 6 years old and adolescents, with only scarce relevant data on Greek and ethnic minorities' preschoolers in Greece [8,51,52]. Thus, assessment, investigation and interpretation of existing ethnic differences in pre-school age overweight and the mediating role of early life factors in this association is of extremely important.

In addition, although PA trends to vary between preschoolers of diverse ethnic groups [8,35], little is currently known [35]. Ethnic differences in prevalence of childhood and preschool overweight/obesity, BMI and PA have been extensively investigated in the USA, while European studies on this topic are scarce [36,37]. Further evidence on these trends and associations is essential, especially in countries of the Mediterranean region, that have increased rates of immigrants and increased overweight/obesity tendency [38].

Finally, we couldn't neglect the noticeable literature gap about the differences in TV viewing time between preschool children and their families from different ethnic backgrounds in Europe, and especially in Greece. Longitudinal studies on the development of TV viewing time among children with different ethnic backgrounds may provide important information to policy makers and researchers regarding the optimal age as well as which groups to target with preventive interventions aimed at reducing excessive TV viewing time behavior in early life.

1.3. RESEARCH AIMS & OBJECTIVES OF THE STUDY

The current study, performed during the recent challenging period of the financial and refugee crisis in Greece, attempted to minimize the vacuum in the current knowledge on dietary and lifestyle patterns determining health parameters in under 5 years old children of different ethnic background. The aims of this study were:

- To assess Greek and immigrant preschoolers and their families regarding body mass index (BMI), nutritional habits and adherence to the Mediterranean diet (KIDMED score).
- To investigate the individual and parental dietary and lifestyle factors associated with OW/OB among preschoolers in Athens, Greece.
- To assess family and individual lifestyle habits (including nutrition and physical activity) as predictors of BMI and adherence to the Mediterranean diet.

Additional objectives **of this study were:**

- To explore further variations between native and non-indigenous families including the evaluation of guardian parents' BMI and lifestyle characteristics; such as smoking, alcohol consumption and physical activity, preschoolers' adherence to the Mediterranean diet-like pattern and the exploration of family and/or individual indicators associated with preschoolers' increased BMI.
- To further explore the level of potential correlation of guardian parents' and preschoolers' dietary habits.
- To investigate the parental dietary and lifestyle trajectories that most strongly predict and determine native Greek and immigrant preschoolers' BMI and KIDMED score.
- To identify predictors of high and low preschoolers' BMI (including several familial characteristics and habits), as well as predictors of low KIDMED score.
- To assess levels of physical activity and explore PA associations with BMI in preschoolers of different ethnicity, residing in Attica, Greece with respect to parent's attitudes over child's feeding and PA behaviors.

1.4. RECEARCH QUESTIONS & HYPOTHESIS

According to the aims and objectives of our study, several **research questions** were formed and attempted to be addressed, as follows.

- Which are the current levels and potential variations of BMI among native and immigrant preschoolers in Attica region?

- Are there any differences between their nutritional and lifestyle habits? To what extend do family and individual lifestyle habits affect BMI and adherence to the Mediterranean diet?
- Which are the current levels and potential variations of vigorous PA (outdoor play, sports participation, active transport to/from school) or sedentary behaviors (television viewing, video/DVD and computer game use) among native and immigrant preschoolers in Attica region?
- Are there any associations between BMI levels and PA measurable indicators?
- To what extend increases in preschoolers' BMI could be affected by low levels of PA and vice versa?

Research Hypothesis

Regarding the investigation of the sociodemographic profile of the guardian parents Greek and other nationalities in our study, and taking into consideration the outcome from the literature that Ethnic subgroups are often minority groups with a lower socioeconomic position than the main ethnic group within a country, we hypothesized:

- That families' sociodemographic characteristics and profile would vary according to nationality

Under the scope to investigate *the individual and family's lifestyle impact on Greek and different nationality preschoolers' dietary habits and BMI* during the austerity period in Attica, Greece, the following research hypothesis were further set to be explored:

- That there would be high level of concordance of guardian parents' and preschoolers' dietary habits.
- That family's lifestyle would be correlated with preschoolers' BMI & KIDMED score in any ethnic group
- That family's lifestyle would have a strong impact on preschoolers' dietary habits and BMI, regardless ethnicity.

- Differences would be observed in BMI rates between Greeks and non-indigenous guardian parents and preschoolers.
- There would be variations in lifestyle habits between Greek parents' and other ethnicity guardian parents', such as levels of adherence to the Mediterranean Diet, smoking status alcohol consumption, levels of physical activity.
- Low levels of adherence to the Mediterranean diet, guardian parent's smoking status and alcohol consumption would be factors positively associated with child's BMI.
- Guardian parent's, child's physical activity and child's KIDMED score would be protective factors regarding preschoolers' BMI.

Furthermore, according to our research goal to explore *levels of adherence to the Mediterranean Diet pattern and related BMI of preschoolers form migrant and native origin*, the following research hypothesis were set:

- Differences between indigenous Greek and immigrant preschoolers would be observed in the sub-categories of KIDMED score measuring Mediterranean diet habits.
- Greek preschoolers, despite the economic difficulties of the Greek austerity period, would follow healthier nutritional habits compared to their immigrant peers, whose nutritional lifestyle would be expected to be closer to their culture food choices.
- Preschoolers of other ethnicities would present lower levels of adherence to the Mediterranean diet comparing to their native Greek peers.

Moreover, our research hypothesis interrelated to our research aim to *explore possible PA variations between Greek and ethnic minority preschoolers concerning PA & BMI, levels of PA participation during school schedule and outdoor activities in spare time*, were formed as follows:

- Frequency of physical activity would be inversely correlated to body mass index regardless ethnicity.
- Some particular habits (such as TV watching daily and in weekends, mother's time spending in watching TV or using the computer and parent's feeding practices, like

attempting to provide food even when the child is not hungry) would increase risk of high body mass index in preschoolers, regardless ethnicity.

- Preschoolers of other ethnicity would watch TV more hours daily comparing to Greek, as well as during weekends.
- Ethnic minority preschoolers would express lower levels of Vigorous PA and higher levels of sedentary PA activities due to less participation in sports activities inside and outside school, as a result of familial time and economic restrictions, barriers and disadvantages, related to SES.
- Guardian parents of other ethnicities would dedicate less time to engage themselves in PA, compared to Greek parents.
- Parents' nutritional and PA behavior over preschoolers would have a strong impact on child's BMI. We specifically hypothesized that maternal behavior towards child's feeding and nutritional habits could negatively or positively influence child's food intake, appetite arousal and food portion size.
- Greek parents would have a more controlling attitude towards their children eating habits and behaviors, compared to immigrant parents.

1.5. Significance of the study

Although ethnic differences in childhood and adulthood are known, ethnic differences in preschool overweight and associated factors are less studied[4]. Focusing on the Greek context, although migration from Eastern European countries during the last decade, and lately from Syria, due to the unstable social and economic background, has occurred, reaching alarming rates, to the best of our knowledge, no study has been carried out up to now to investigate the dietary habits of immigrant children in Greece[8].

This study is considered to be significant because it maps a theoretical and original research-based framework of the individual and familial factors influencing dietary and physical activity behaviors in Greek and ethnic minority preschoolers living in Greece, setting light for further research prioritization and intervention development in the crucial and sensitive field of early childhood health outcomes. This is, also, the first study to investigate socioeconomic and

ethnicity-related differences in Greek and other ethnicities preschoolers' vigorous intensity physical activity behavior, accounting for moderate physical activity.

This doctoral thesis presents the latest trends in factors shaping and determining obesity, eating behaviors, physical activity and sedentary behavior in Greek and other ethnicities preschoolers. It brings together for the first time data on obesity-related behaviors to review the latest evidence and consider the range and complexity of factors influencing childhood obesity, highlighting possible gender, ethnic, socioeconomic similarities and inequalities.

Our findings illustrate that innovative research and complex interventions need to be developed that are sensitive to the needs of ethnic minority populations. The primary results of our study, discussed under the light of the literature, seek to guide parents, educators and health professionals in developing more effective interventions for the prevention of childhood obesity in Greece and other countries of similar socio-demographic profile. A systems approach that encompasses the complexity of the inter-related factors that drive behaviors may inform a more holistic public health paradigm to more effectively reach preschoolers from ethnic minorities living in Greece, as well as the majority host population.

1.6. Personal and professional involvement; the key role of Early Childhood Education teachers' in promoting healthy practices in education in a multicultural context.

Involvement in this research project that aims to encompass two fundamental and sensitive fields of human care, education and health, was developed from a long-standing personal and professional interest in the school's role in promoting a healthy lifestyle. Having taught in a number of kindergarten schools for 18 years and a Master Degree educational orientation in Multicultural Education and Human Rights, I strongly believe that, through this thesis assessing fundamental health issues in native Greek and ethnic minorities' preschoolers, the fertile *symbiosis and of program action of health and education in a multicultural context* is accomplished.

As childhood obesity rates have increased, consensus has emerged that schools have an important contribution to make in reversing this trend. Preschools, in particular, through a play-

based education, are seen as a key setting for obesity prevention as they reach the majority of children and their families, particularly those with a migration background or low socio-economic status, and have long-term, in-depth contact with them. Schools offer many opportunities to prevent obesity by creating environments in which children eat healthily and engage regularly in PA. Their physical environment, policies, curricula and personnel have great potential to positively influence child health, and schools can play a vital role in instilling healthy behaviors that carry forward into adulthood. The school environment can reinforce or hinder messages delivered through the curriculum and can thereby either promote, or create barriers for, healthy behaviors[53]. Early Childhood Education teachers in Kindergartens are potential key actors for promoting healthy eating and physical activity in preschoolers, setting a healthy example and be positive role models in healthy eating and physical activity behaviors[54].

In the light of this potential role, the knowledge, attitude and practices regarding healthy eating and physical activity, and consequently the level of confidence of Early Childhood Education teachers in promoting healthy eating and physical activity in young children is of extreme interest.

1.7. Theoretical framework of the Study

Based on the belief that our research aim, the study of lifestyle factors determing health aspects/ parameters of native Greek and ethnic minority preschoolers' in Attica, Greece, can be explained and analyzed under the conceptual framework of a *multifactorial etiology and parameters*, and searching for the comprehensive model that could serve as a useful heuristic device to promote the investigation of the complex of childhood overweight and facilitate the development of effective intervention and prevention programs, we based our thesis on the ***Ecological Systems Theory[55]***.

As preschool children, due to their age level, are unlikely to have the cognitive ability or autonomy to control or reflect on their own behaviors, we believe that Ecological Systems Theory constitutes a comprehensive model of the factors implicated in the development of childhood overweight,

such as children's dietary and activity patterns, parenting practices that shape children's dietary and activity practices, and the environment in which parenting takes place, also incorporating child characteristics, such as gender and age, that influence parenting practices and moderate the impact of risk factors on the development of overweight.

Therefore, the usefulness of EST will be illustrated by using it as a framework to evaluate and integrate research assessing risk factors for childhood overweight including children's dietary intake, physical activity, and sedentary behavior and to consider familial and societal characteristics that influence the emergence of Greek and other ethnicity preschoolers' health risk and / or protective behavior predictors and determinants.

Ecological Systems Theory (EST)[55] conceptualizes human development from an interactive contextual perspective. According to EST, development, or change in individual characteristics, cannot be effectively explained without consideration of the context, or ecological niche, in which the person is embedded. An ecological niche includes not only the immediate context in which a person is embedded, but also the contexts in which that context is situated. In the case of a child, the ecological niche includes the family and the school, which are in turn embedded in larger social contexts including the community and society in general. In addition to these larger contexts, characteristics particular to the child, such as gender and age, interact with familial and societal characteristics to influence development. To summarize, according to EST, development occurs as a result of interactions within and among these contexts; that is, characteristics of the child interact with processes in the family and the school, which themselves are influenced by characteristics of the community and society at large. The application of EST to predictors of childhood overweight is illustrated in Fig.1.

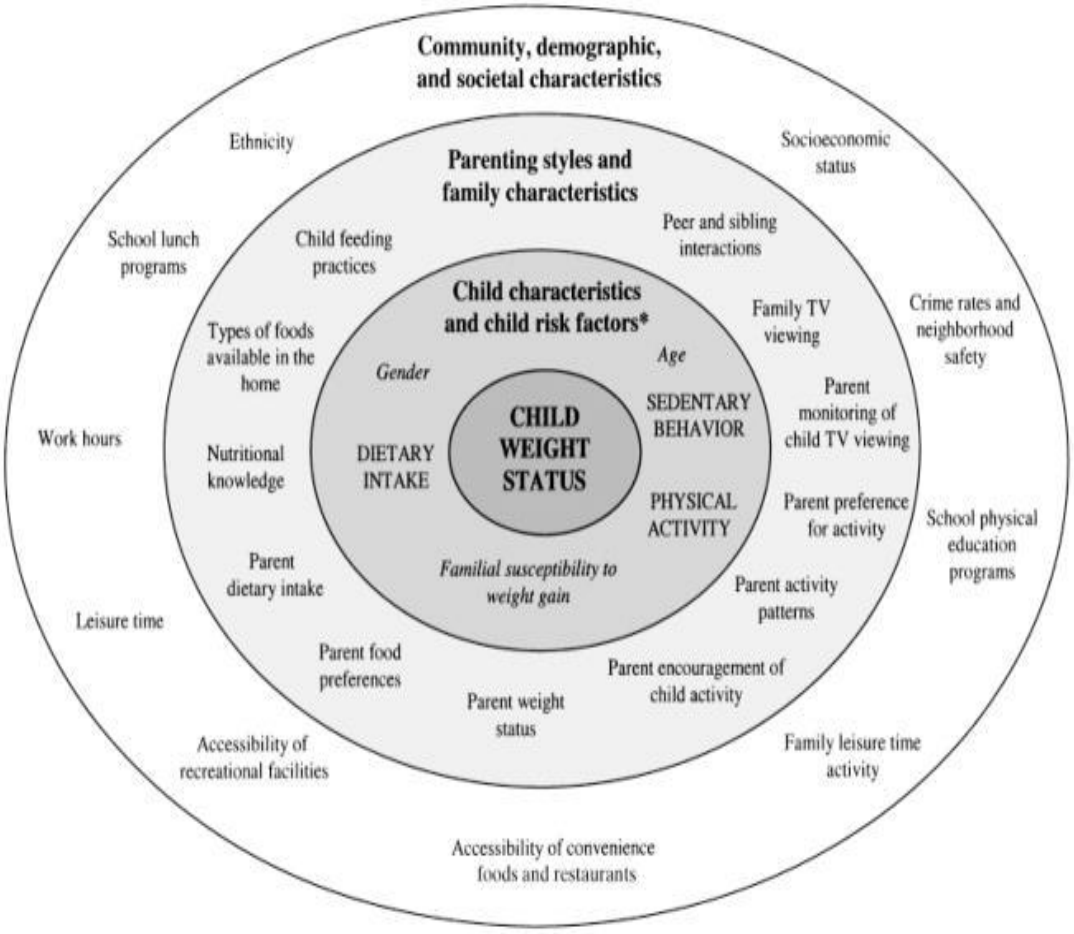


Fig.1. Ecological model of predictors of childhood overweight.

Figure 1 presents a model of the development of childhood overweight based on the results of research assessing predictors of childhood overweight in combination with EST. According to this model, child behavioral patterns such as dietary intake, physical activity, and sedentary behavior (such as TV viewing, computer use) can place a child at risk of overweight (shown in upper case lettering in Fig.1); these factors will be referred to as '***child risk factors'***. The impact of child risk factors on the development of overweight is moderated by child characteristics including age, gender, and susceptibility to weight gain. The development of child risk factors is shaped by parenting styles and family characteristics, such as parents' dietary intake and activity patterns, nutritional knowledge, child feeding practices, and peer and sibling interactions. Characteristics of the school environment, such as structured periods for activity and the dietary quality of school lunches, and community, demographic, and larger

environmental factors, such as parent work-related demands (i.e. work hours and leisure time), ethnic background and the availability and accessibility of recreational facilities, influence child weight status as a result of their influence on parenting practices and children's daily eating and activity behaviors.

1.8. Structure of the Study

This doctoral thesis is composed of five chapters. In *Introduction Part One* Background Information, Statement of the Problem; purpose and Objectives of the Study, as well as Definition of Key Terms and Concepts, and the significance of the study have already, been presented. Following the Ecological model of predictors of childhood overweight, as presented above, and our research objectives, we highlighted and addressed the characteristics of native Greek and immigrant preschoolers and the familial and societal contexts in which they are embedded in order to understand those parameters that determine health in early childhood. *Part Two of the Introduction* assesses the first core study subject of this thesis, early childhood overweight and obesity among preschoolers from migrant and native origin, under the light of the literature review, while *Part Three* presents the interconnected investigated subject of this study, that of the adherence to the Mediterranean Diet in relation with preschoolers' from migrant and native origin BMI. *Part Four of the Introduction,* focusing on the international context and the Greek reality, is assessing, through literature review, the impact of Vigorous Physical Activity and sedentary behavior on native and immigrant preschoolers' Body Mass Index.

The Research Methodology of the study is presented in *Chapter Two* and the original results are presented in *Chapter Three*. Finally, interpretation of the findings of this doctoral thesis are being critically discussed under the prism of current literature in *Chapter Four*, along with the Strengths and Limitations of the Study. Finally, Conclusions, key messages and implications of the study and suggestions for future research are presented in *Chapter Five*.

Introduction Part 2

Factors related to overweight and obesity among preschool children from migrant and native origin: a literature review

2.1. Early childhood overweight and obesity: prevalence and trends of a public health epidemic

Overweight and obesity, according to Word Health Organization, are defined as ''abnormal or excessive fat accumulation that presents a risk to health[56]. However, a distinction can be made between both terms with overweight being defined as increased body weight above an arbitrary standard, and obesity being defined as an excess of body fat which creates increased risk of adverse health outcomes[57].

Obesity alarming rising trends seem to gradually stabilize or may be plateauing in some settings [5,58], nevertheless, World Health Organization (WHO) illustrates the global pandemia of obesity as the severest form of overweight affecting children both in developed and developing countries [1]. A worldwide increase in levels of overweight and obesity (OW/OB) in preschool age has been reported, with the prediction to reach 9.1% in 2020 [59]. However, limited information is available on prevalence of obesity and its contributing factors, in preschool children. The few studies that have been published on overweight and obesity among preschool children, coming predominately for the USA and Canada, have demonstrated that a trend towards increasing weight is also occurring in this age group [34,60].

2.1.2. European and Greek Trends of overweight and obesity in early childhood

Within the European context, countries of the Mediterranean region and the British islands report the highest rates of overweight and obesity in preschoolers, while the lowest scores are reported in central, middle, eastern and northern Europe countries [61]. In the European Union the number of overweight children is expected to rise by 1.3 million per year, with more than 300.000 of them becoming obese each year[62].

Preschoolers' OW/OB prevalence was also recorded in the 'ToyBox' Study[63], conducted in six European countries (Belgium, Bulgaria, Germany, Poland, Spain, and Greece), where

participants presented the lowest levels of diet quality, physical activity, but the highest levels of sedentary time and differences in diet, physical activity and sedentary behaviors [64,65].

Large differences were found across the six European countries, and overall, in girls there was a higher prevalence of OW/OB compared to boys; the prevalence of overweight in boys ranged from 9.4% in Belgium to 26.8% in Spain, whereas obesity ranged from 0.6% in Belgium to 10.1% in Greece. In girls, the prevalence of overweight ranged from 13.0% in Belgium to 38.2% in Spain, and obesity ranged from 1.0% in Belgium to 12.0% in Greece. The highest rates of overweight and obesity were found in the South-European countries (i.e., Greece and Spain), while the lowest rates were found in the West-European countries (i.e., Belgium and Germany) [64,66].

Additionally, the Growth, Exercise and Nutrition Epidemiological (GENESIS) Greek Study revealed that Greece has possessed the highest OW/OB prevalence (20.6%) [67], thus being among the European countries with the highest levels of childhood obesity[68]. It is estimated that the prevalence of overweight and obesity is markedly different among children and adolescents in Greece and elsewhere[69,70].

2.2. Health consequences of overweight and obesity

As preschool children are still young and are generally healthy, there is no evidence yet on the association between preschool children's overweight and obesity and health consequences [64]. However, this evidence is already existent in older children and will be discussed below. Overweight or obese children run a higher risk of developing health problems. In the short term, childhood obesity can lead to psychological or psychiatric co-morbidities (i.e., low self- and body-esteem, behavioral problems, social victimization and peer teasing, popularity and friendship being affected), cardiovascular risk factors (e.g., hypertension, dyslipidemia, and insulin resistance), asthma, and chronic inflammation. Health consequences of childhood obesity in the long term include adverse social and economic effects (e.g., social isolation, educational attainment, income, medical costs, school/work absenteeism), tracking of overweight, obesity and cardiovascular risk factors, and morbidity and increased risk of

premature mortality [57,71,72]. In addition, the adiposity rebound period – the age at which body fatness reaches a post infancy low point – typically occurs between the age of four and six years old, and is inversely associated with the risk of developing overweight in adulthood. Therefore, targeting this young age group to prevent excessive weight gain might be promising, as children who undergo early adiposity rebound are at increased risk of later obesity [73].

2.3. Factors connected with etiology of Overweight and Obesity in early childhood

Overweight is the result of an excess of energy intake on energy expenditure, during a longer period of time[74]. Etiology of Overweight and Obesity (OW/OB) in early childhood is multifactorial and multidimensional, as overweight and obesity is regarded as, in which genetic, biological, and environmental factors play a key role[75].Given the global nature of the problem, a greater understanding of context-specific correlates of obesity is required in order to develop effective interventions that can be translated from one setting to another.

Apart from child characteristics, such as gender and age, and child risk factors, for example physical activity and dietary intake, family characteristics in the home environment are involved. These characteristics include weight status of the parents, an important risk factor for overweight in children, and parenting styles, like the role modeling that parents display or policies they practice regarding specific types of lifestyle behavior[76]. Furthermore, characteristics in the community, such as the neighborhood or the school, and demographic and societal characteristics, for example ethnicity and socio-economic status, play a role. Besides the above named characteristics and risk factors, short sleep duration as an independent behavior is also associated with higher frequencies of overweight and obesity[77,78].

2.3.1. Socio-demographic factors related to overweight and obesity; the role of ethnicity

Socioeconomic factors, and cultural norms relating to eating/feeding and movement behavior (i.e. physical activity, sedentary behavior, and sleep), and body image are of particular interest because of their potential relationship to differences in obesity prevalence and the nature of obesity interventions that are appropriate and potentially effective in low- and middle income

countries compared with high-income countries, and also in different sociodemographic and cultural groups within countries[79].

Among children in European countries, there is a large diversity of ethnic groups. Ethnic subgroups are often minority groups with a lower socio-economic position than the main ethnic group within a country. Lower socioeconomic position and minority status are suggested to be associated with a lower health status, including overweight.

2.3.2. Family's lifestyle factors as determinants of preschoolers' overweight and obesity status

The family system that surrounds a child's domestic life will have an active role in establishing and promoting behaviors that will persist throughout his or her life[80]. Early-life experiences with various tastes and flavors have a role in promoting healthy eating in future life. In the current analysis, parental food habits and feeding strategies are the most dominant determinants of a child's eating behavior and food choices. Parents should expose their offspring to a range of good food choices while acting as positive role models.

Home environment is documented as one of the main settings that influences lifestyle behaviors[81]. Caregivers play a key role in the development of the physical and social home environment[82]. In this so-called obesogenic environment, limited physical activity, unhealthy dietary intake, or low sleep duration is probably enhanced. In the physical environment, both availability, and accessibility, for example with regard to food, affect dietary intake[83]. In the social home environment, the behavior that the parents display themselves, for example regarding exercise, can be considered as a role model for their children. Besides parental modeling, parental policies and parenting styles are important, for example, by encouraging and prompting children to be physically active[84,85].

2.4. Concordance between parental influence on children's dietary habits

Parents, as "exclusive agents of change", can exert significant influence on a preschooler's diet through control over foods available in the home and monitoring of child eating behavior. In

fact, change in parent motivation during engagement in weight control treatments (WCT) has been related to change in dietary behaviors and BMI outcomes in preschoolers [86]. Therefore, changes to dietary behaviors may be more easily influenced at this family level than other health behaviors, such as physical activity, which may require more systemic changes, such as modification of day care schedules or outdoor available play spaces.

Parents provide food environments and experiences with food and eating for their children. Children model themselves on their parents' eating behaviors, lifestyle, eating-related attitudes, and satisfaction or dissatisfaction regarding body image. Dietary habits are shaped at a young age and maintained during later life with tracking over time [87]. Eating behaviors established in childhood persist, with implications such as fussiness and poor dietary variety, or high responsiveness to food cues and increased obesity risk. Although eating behaviors and child weight are difficult to modify directly, parental feeding practices are potentially a good target for interventions to prevent unhealthy eating patterns and developing excess weight in children [88].

2.5. Parental BMI as determinant of preschoolers' overweight and obesity status

Research data coming from a study performed in 2016 in preschoolers' in Italy demonstrate the significant association between parents' BMI and children's body weight[89], as already demonstrated in a previous study[90], and this was expected because of the interplay between the common genetic background and the exposure to the family environment.

The interrelated significant risk effect on parental BMI on preschoolers' BMI was also the case in the findings of the Greek GENESIS study [10] assessing prevalence of obesity in preschool Greek children, in relation to parental characteristics; high parental weight increased the risk of being "overweight" or "at risk of overweight" in preschoolers. More precisely, the prevalence of being overweight or at risk for overweight in age group 3 to 5 years old children was significantly greater for children with one or two obese parents with increasing tendency rates as the number of obese parents increased. According to the GENESIS Study on preschoolers [10], children with one or two obese parents had 1.96 times greater odds for being overweight

compared to those with no obese parent. Additionally, children with one obese parent had 91% greater odds for being overweight compared to those with no obese parent, while the likelihood for being overweight was 2.38 times greater for children with two obese parents[10].

This trend of increased risk of overweight with increasing parental overweight is in line with other published data [91]. This effect of parental obesity on children's risk for increased adiposity is one of the most consistent findings in the controversial field of obesity [92] concluding that children adopt their parents' eating habits as a result of environmental exposure.

2.6. Family meals and their relation to preschoolers' overweight and obesity

Family members share similar eating habits that are affected by individual factors and the family food environment [81,93]. Parental role modeling and perception of adequacy of their child's diet are important predictors for the child's current dietary behavior and watching the parents eat raises the children's awareness of their parents' eating behaviors[94]. Thus, parents build their children's food environment by making healthy or unhealthy foods available.

Determinants of childhood obesity include dietary intake behaviors, meal patterns and physical activity [95]. A relevant dietary behavior among children is eating regular meals [96] i.e. breakfast, lunch, and dinner. Previously published results from the ENERGY (EuropeaN Energy balance Research to prevent excessive weight Gain among Youth) project reported that children who had breakfast and dinner, and children eating 3 meals (breakfast, lunch and dinner) were less likely to be overweight or obese [97]. In addition, the context in which these meals are consumed may also play a role; eating meals as a family has been reported to be inversely associated with overweight in children [98].

It has been observed that the person who prepares the majority of family meals largely influences the consumption of fruit and vegetables but also high-fat foods; this association increases with increasing numbers of shared meals [99].Despite the fact that fathers and mothers were found to influence the child's eating behavior[100,101], the influence differs for mothers compared to fathers[102,103]. Paternal dietary influence was identified for fruit but also for fat-and energy-dense, nutrient-poor foods[104,105], whereas positive child–mother correlations have been

reported for fruit and vegetable intake[106] and soft drinks[107]. Accordingly, children's food consumption was associated with healthy foods (so-called core foods, e.g., cereals, dairy, fruit, and vegetables) or with unhealthy non-core foods (e.g., snack foods, fats, and oils) [100].

Previous research has demonstrated that the association between parental and child intake increased with an increasing number of family meals at home [99] and that the number of family meals was positively associated with the consumption of healthier foods [106]. Family mealtimes provide structure and a regular opportunity for developing emotional connections among family members and therefore help children to monitor their mood and learn healthy dietary behaviors [108]. Accordingly, higher family meal frequency was found to be associated with significantly fewer weekly servings of sweets and sugar-sweetened beverages [109]; however, the consumption of those non-core foods (e.g., sugar sweetened beverages) was found to be higher when their home availability was higher [109].

2.7. Television viewing in home environment and obesity; European and Greek data regarding preschoolers and the role of ethnicity

2.7.1. Records and effects of the sedentary habit of TV viewing in preschoolers

It is thoroughly acknowledged as a symptom of our modern society that Individuals and especially young children spend a substantial part of their lives in front of a screen[9], that television viewing is still the predominant screen time behavior for preschoolers[110].Several studies have proposed that the excessive TV viewing time is generally associated with a variety of adverse outcomes among preschoolers, school-aged children, and adolescents, such as violent or aggressive behaviors, several psychosomatic symptoms (i.e., attention-deficit/hyperactivity disorder–associated behaviors) [111-113] and especially with overweight or obesity [114,115]. In response to the growing problem of childhood obesity, the American Academy of Pediatrics has proposed a limit of no more than 2 h/day exposure of children to TV and video for children aged 5-12 years should spend no more than 2 hours a day on electronic media for entertainment [116,117]. Nonetheless, there remains room for improving the screen use behavior in most young children[118].

2.7.2. Obesity risk and levels of TV viewing in Greek preschoolers

Deepening our research interest on data concerning levels of TV viewing in Greek preschoolers, we could notice that despite the fact that the prevalence of overweight is high among Greek children[67] and TV viewing time is a proposed risk factor for childhood obesity, no studies have been conducted in Greece to investigate this potential association, with the exception of Growth, Exercise and Nutrition Epidemiological Study in preSchoolers" (GENESIS) study[67]. Observations from the GENESIS Study in Greek preschoolers [67] exhibit that the percentage of children watching TV <1 h/day was significantly higher among children aged <3 years compared to those aged 3–5 years. Children who watched TV ≥2 h/day were older, more likely to have low physical activity, to live in large urban/urban regions, to have higher total energy intake, and to have low-educated mothers compared to children who spent <2 h/day in front of the screen. Moreover, the parental TV viewing time was longer among children who watched TV ≥2 h/day compared to those who spent <2 h/day in front of TV. It was detected that the prevalence of obesity was significantly higher among children that spent ≥2 h/day in front of TV compared to those that watched TV <2 h/day. Moreover, the prevalence of overweight and obesity was significantly higher in girls watching TV ≥2 h/day.

2.8.The connection of familial and/or individual sedentary habit of TV viewing with ethnicity and parental sociodemographic level.

Studies examining the connection of familial and/or individual sedentary habit of TV viewing with ethnicity, have revealed that young children in ethnic minority groups spend more time watching TV than their native counterparts [119,120]. Research data from The Generation R Study[121,122] performed in the Netherlands with children at ages from 2 to 9 years, with Dutch, Turkish, Moroccan, or Surinamese ethnic background also indicated that television viewing trajectories differed between ethnic subgroups. The percentage of children viewing television >1 hour/day increased from age 2 to 9 years for children from all ethnic backgrounds, but after adjusting for maternal educational level and net household income, children from all ethnic

subgroups had greater odds of watching television >1 hour/day at some time points compared with children with a Dutch background.

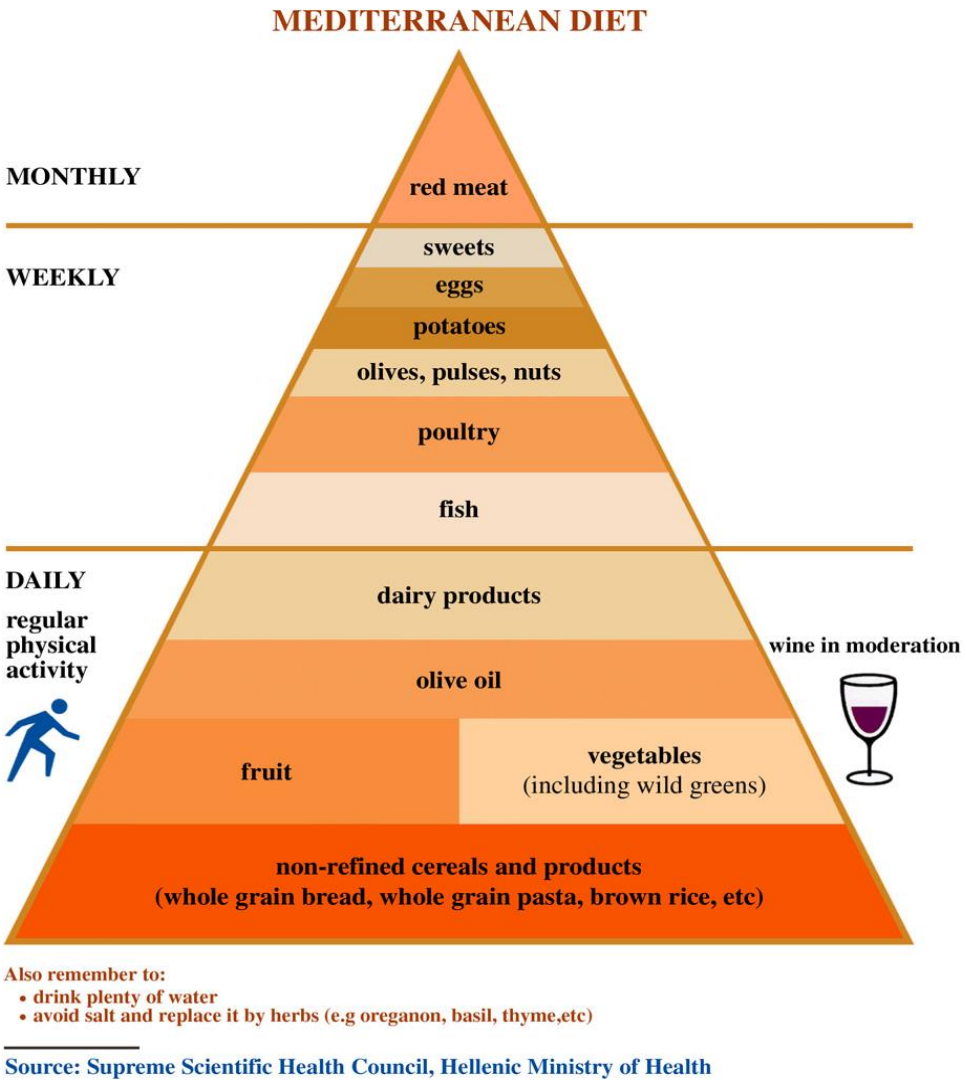
It has been well documented that indicators of family SES (i.e., maternal educational level and net household income) are inversely associated with children's TV viewing time[121,123].

Apart from ethnicity, The Generation R Study also revealed the synergistic effect of maternal education level in children's television viewing trajectories: The interaction term between ethnic background and measuring time point, and the interaction between ethnic background and maternal educational level were both significant at the significance of the interaction term between ethnic background and maternal educational level indicated that TV viewing trajectories differed significantly at each maternal educational level.

Moreover, it has been consistently reported that parental attitude toward TV viewing and home environment factors are associated with higher children's TV viewing time [123]. Not highly educated mothers have been reported to display more positive attitudes about TV viewing, believing that TV programs are instructive and stimulating [124]. Apart from parents' own TV viewing time, parental attitude and control practices towards children's TV viewing (i.e., allowing a TV set in the child's bedroom) also play an important role in children's TV viewing behavior. Generation R Study outcomes showed that children from all three non-Dutch ethnic groups more often had a TV set in their bedrooms compared to children with a Dutch background[121].

Introduction: Part 3

Adherence to the Mediterranean Diet Pattern and related BMI of preschoolers' from migrant and native origin



3.1. Definition and health benefits of the Mediterranean Diet.

The term Mediterranean Diet (MD) has been widely used to describe the traditional dietary habits followed by the populations in Greece, southern Italy, Spain, and other countries of the Mediterranean region during the 1960s [125]. Although the definition of the MD is not consensual, mainly because this dietary pattern is rather heterogeneous among Mediterranean countries[125126],Mediterranean Diet is common in Mediterranean countries, and is based on a set of healthy dietary habits that include relatively high consumption of unprocessed foods and plant foods, such as vegetables, legumes, grains, nuts, fresh and seasonal fruit, breads, and unrefined cereals. The pattern is also associated with moderate to high intake of fish, moderate intake of dairy products (mostly cheese and yogurt), low intake of red meat and saturated fatty acids, and higher intake of unsaturated fatty acids, with olive oil as the main source of fat [126,127]. As food consumption is affected by different factors, including food availability, accessibility, and choices, which in turn may be influenced by geography, demography, socioeconomic status, urbanization, globalization, marketing, and consumers, differences in culture, ethnic background, religion, economy, and agricultural production, there is the consequent result of the existence of different types of diets across the Mediterranean region [27].

The MD has been promoted intensively during the past two decades for its numerous health benefits; there are many intervention and epidemiological studies suggesting that the MD is protective against several morbid conditions including atherosclerosis, coronary heart disease, diabetes, metabolic syndrome, and inflammation[128,129]. Greater adherence to a Mediterranean-like dietary pattern is associated with longevity[130], a significant improvement in health status, especially reductions in the risk of developing metabolic syndrome and major chronic morbidities[128].

3.2. Methods for the evaluation of the adherence to the Mediterranean Diet in children and adolescents; the Mediterranean Diet Quality Index for children and adolescents (KIDMED SCORE)

In the pediatric population, the Mediterranean Diet Quality Index (KIDMED), in association with obesity indicators, has been used to assess adherence to a Mediterranean-like dietary pattern; The majority of studies concerning the beneficial effects of the MD, aiming to assess overall diet quality and to determine those dietary schemes and habits that promote human health refer to adult populations. Nevertheless, there are studies In the pediatric population conducted using modified versions of the MD score, an index introduced by Trichopoulou et al. [130], but the vast majority of the studies use the Mediterranean Diet Quality Index for children and adolescents (KIDMED) index, a tool recently developed to assess the degree of adherence to the MD, in association with obesity indicators, suggesting that MD may be an important health-promoting factor for children as well as adults[129]. The KIDMED index is based on the principles sustaining the Mediterranean dietary pattern as well as those that undermine it (such as frequent consumption of fast food and increased intake of sweets).

KIDMED, Mediterranean Diet Quality Index in children and adolescents.

+1 Eats a fruit or drinks fruit juice every day
+1 Eats a second serving of fruit every day
+1 Eats fresh or cooked vegetables regularly once a day
+1 Eats fresh or cooked vegetables more than once a day
+1 Consumes fish regularly (at least 2–3 times/week)
_1 Goes more than once a week to a fast-food (hamburger) restaurant
+1 Likes legumes and eats them more than once a week
+1 Consumes pasta or rice almost every day (_5 times/week)
+1 Eats cereals or grains (bread, etc.) for breakfast
+1 Consumes nuts regularly (at least 2–3 times/week)
+1 Uses olive oil at home
_1 Skips breakfast
+1 Eats a dairy product for breakfast (yogurt, milk, etc.)
_1 Eats commercially baked goods or pastries for breakfast
+1 Eats two yogurts and/or some cheese (40 g) daily
_1 Eats sweets and candy several times every day

3.3. Dietary intake patterns of native Greek and immigrant preschoolers and levels of Adherence to the Mediterranean Diet pattern.

In several industrialized countries, national epidemiological surveys have been conducted, examining and describing dietary intakes and preferences of toddlers and preschool children revealing increased consumption of energy, inadequate intakes for certain nutrients (e.g., fiber), excessive intakes of other nutrients (e.g., total fat, saturated fat, and sugar) [131], and low fruit and vegetable intake [94].

In Greece, however, there are only a few studies assessing the nutrient intake of Greek preschoolers, with the *GENESIS Study*[132] being the most representative. The majority of preschoolers (>90% of participants) had a poor diet, according to Healthy Eating Index (HEI) score that was used in the study, exhibiting extremely low vegetable intake and excessive consumption of saturated fat and "good" diet regarding milk, cholesterol, and sodium consumption. Sociodemographic parameters, such as sex, age, and place of living as well as maternal educational and employment status, were factors significantly associated with the total score.

It was realized that Greek preschoolers' dietary habits adhere more to a *Western diet pattern* rather than to a Mediterranean diet as was expected. These findings are consistent with the results of other studies conducted in Greek populations, indicating that dietary habits in Greece have shifted during past decades toward a more Westernized pattern [133,134]. In particular, it has been revealed that fat intake among children was much higher than recommended [134], with young children consuming sugar added beverages on a daily basis and this is strongly related to low intake of fruit and vegetables [135].

3.4. The role of family's socioeconomic status (SES) and socioeconomic position (SEP) in the dietary habits of preschoolers and the risk of low KIDMED Score

Family's socioeconomic status (SES) and socioeconomic position (SEP)is of crucial importance and is determing the dietary profile of their children and their healthy, or unhealthy dietary choices. There is good evidence that diet quality follows a socio-economic gradient. It has been shown that the economic constraint in developed countries often leads to the consumption of high-energy but low-nutrient dense diets [136,137]. In addition, a growing number of studies suggest that children in lower-income families in developed countries are particularly vulnerable to becoming obese possibly due to poor diet, limited opportunity for physical activity and factors related to food security issues [138]. Given that dietary habits are established in childhood, children of low-income families are at particular risk of establishing lifelong poor quality dietary habits particularly during economic crises[139].

More specifically, as the economic status of an individual, or family, decreases there is an increased reliance on cheaper high-calorie diets rather than the more expensive nutrient-dense diets [140]. Studies predominately contacted in the USA, suggest that economically constrained families, in comparison to high-income families, tend to consume higher quantities of fatty meats, refined grains and added fats. In addition, poorer families are less likely to consume fresh fruits and vegetables, lean meats, fish, whole grains and low-fat dairy products. The consumption of low quality diets in response to the high cost of nutrient-dense diets has also been shown in other developed countries, such as the UK, France, and Denmark [141,142].

In the case of Greece, the possible role of socio-economic status (SES) on diet quality and specifically on adherence levels to the Mediterranean diet (MD), has not been thoroughly investigated in the past. According to the GENESIS Study in Greek preschoolers[132] maternal education level and employment were inversely correlated with children's HEI Score; children whose mothers had low educational status (ie, >9 years) or were unemployed had lower HEI score compared to those whose mothers' education lasted more than 9 years or were employed. This finding implies that children who live in a household with low socioeconomic status have lower diet quality compared to children from households with high socioeconomic

status. This result is in agreement with previous studies reporting that socioeconomically disadvantaged groups adopt a dietary profile less consistent with dietary recommendations [76,143].

People with low education status have low level of knowledge about healthful dietary practices and their benefits on health [144]. Moreover, as education level is an important determinant of occupation and a consequent this determinant of income level, it is shown that people with low economic status exhibit food purchasing behavior that is as least as consistent with a healthful dietary pattern as their higher economic status counterparts. More specifically, it has been detected that the former are more likely to purchase high-fat and high sugar foods and less likely to buy foods rich in fiber compared to the latter [144].

3.5. Greek economic crisis and its impact on preschoolers' adherence to the Mediterranean Diet (MD).

The results of another study on the prevalence of overweight and obesity in preschool children in Thessaloniki, Greece[11], which was conducted during the biennium 2009-2010, just at the beginning of the Greek austerity period, on the onset of the economic crisis also revealed low levels of adherence to the Mediterranean Diet. Thus, overweight and obesity in preschoolers may have worsened due to reduced financial circumstances of households, which could lead to increased purchase of low-cost, processed, high-fat food and consequently to poor nutrition and health[145]. Previous studies have suggested that the economic recession has resulted in reduced access to a nutritious diet and impaired nutritional status and health[146,147].

In the case of children and adolescents, the results are less consistent. However, a growing number of studies suggest that children in lower-income families in developed countries are particularly vulnerable to becoming obese[148]. This may be a direct result of the poor quality diets observed in many low-income populations where affordability is a significant barrier to good nutrition and nutrient dense foods, such as fruits, vegetables, nuts and fish, which are prohibitively expensive for economically constrained population. This may result to lower SES families heavily relying on highly processed, less expensive, energy-dense foods. Additionally,

high-calorie, processed foods are generally more convenient to prepare and have a longer shelf life [149].

Introduction: Part 4

ASSESING THE IMPACT OF VIGOROUS PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR ON PRESCHOOLERS' BODY MASS INDEX; THE ROLE OF ETHNICITY: INTERNATIONAL CONTEXT AND THE GREEK REALITY

4.1. Defining physical activity

Physical activity is a behavior that theoretically includes any type of movement from fidgeting to the involvement in extreme and competitive sports. Physical activity is defined as "any bodily movement produced by skeletal muscles that results in energy expenditure" [150].

The habitual physical activity of children, as a latent time series of activity type and intensity [151], comprises all activities performed in the course of a day in an organized setting (e.g., school, sports club, leisure center), during transport/commuting, and while playing with peers. In each of these environments, important dimensions need to be characterized. These include intensity, frequency, and duration, which put together determine the overall activity level of a child. An additional dimension of physical activity is the type or mode such as walking, running, and so on. In preschool children, it primarily occurs through unstructured active play [152,153].

4.2. Benefits of physical activity for young children

The health benefits of physical activity are well recognized. It is well established that physical activity (PA) provides numerous health benefits, such as assisting in the prevention of chronic diseases, balancing energy expenditure, and maintaining a healthy body composition [154]. Additionally, PA increases functional capacities and can reduce cardiovascular risks, while regular and appropriate PA is an important component for normal growth and the development of the aerobic capacity, muscular strength, flexibility, and motor skills of children and adolescents [155].

Regular engagement in physical activity in childhood is associated with multiple physical and psychosocial health benefits, including improved academic performance, improved cardio respiratory fitness, skeletal health, muscle strength, and motor skills, and a decreased risk of childhood overweight and obesity [32,156,157]. Focusing on the research evidence about the beneficial outcomes of PA in the preschool age, higher levels of aerobic fitness and better

motor skills in Swiss preschoolers were positively associated with achievement of better spatial working memory and attention[158].

In addition to making an important contribution to overall physical activity, specific physical activity behaviors such as sports participation (team sports in particular) and unstructured play (outdoor play in particular) are assumed to bring about additional health benefits including increased social integration, teamwork and social skills, emotional control, confidence, discipline, empathy, and emotional well-being [159].

4.3. Physical activity guidelines for young children

Physical inactivity is now identified as the fourth leading risk factor for global mortality. Physical inactivity levels, according to WHO, are rising in many countries with major implications for the prevalence of non-communicable diseases (NCDs) and the general health of the population worldwide[160].

World Health Organization (WHO) guidelines for physical activity for children and young people aged 5 to 17 years group physical activity includes play, games, sports, transportation, recreation, physical education or planned exercise, in the context of family, school, and community activities. In order to improve cardio respiratory and muscular fitness, bone health, cardiovascular and metabolic health biomarkers and reduced symptoms of anxiety and depression, the following are recommended: Firstly, that Children and young people aged 5–17 years old should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily. Moreover, Physical activity of amounts greater than 60 minutes daily is suggested, providing additional health benefits, with the proposal that most of daily physical activity should be aerobic. Vigorous-intensity activities should be incorporated, including those that strengthen muscle and bone, at least 3 times per week. Moreover, steps taken per day guidelines with the minimum suggestion of 60 min of moderate-to-vigorous PA for preschool children, ranged between 10,000 and 14,000 steps/day[161]. However, it is evident that children are currently insufficiently active and fail to achieve PA recommendations [162].

4.4. Physical activity and sedentary behaviors and their relation to overweight and obesity in preschoolers

Physical activity is a key determinant of energy expenditure, which supports energy balance and a healthy body weight. Nevertheless, the 2011 World's Health Organization (WHO) estimation[47] highlighted that more than 42 million preschool aged children are overweight, while low physical activity levels and high sedentary ones are reported by several researchers for that specific age[48,59,163]. Sedentary behavior is commonly addressed as screen-based inactivity in terms of TV watching and computer use[164] and also correlated to unhealthy food habits, TV watching and consumption of sweets[158,165].

Before sedentary behavior emerged as a new focus of research, it was seen as the absence or the opposite of physical activity. However, sedentary behavior is not equal to physical inactivity, since it comprises of a unique set of behaviors that can co-exist with high levels of physical activity [166]. Typical sedentary behaviors during the preschool age are screen viewing activities (i.e., watching television, playing video games), quiet play (e.g., drawing, tinkering, puzzling, looking into books), travelling by car (while being restrained in a car seat), bus or train, or being strapped into a stroller or a highchair [56]. There is emerging evidence that sedentary behavior during the preschool years is associated with the development of overweight and obesity [60]. Also, positive associations between sedentary behaviors and overweight indices were found in a pooled analysis of six European preschool studies that was conducted within the ToyBox-study [167].

4.4.1. Associations between physical activity and Body Mass Index

Preschool years represent a crucial time to study the determinants of childhood obesity[36], because eating and PA habits are becoming established. Low levels of participation in PA activities during preschool years is positively associated with positive energy balance and overweight children and risk for further adiposity. Research evidence[168,169] supports the inversely proportional relationship between preschoolers' BMI and PA participation, arguing that *the higher the PA level the less the body fat gain is*. As a result of failing to meet the PA

guidelines for young children, an increasing number of children are obese and overweight. Further, a lack of physical activity negatively affects overall health. Studies performed with children have confirmed that screen time (i.e., time spent watching TV and playing video games) and inactivity levels are strongly associated with obesity risk and increased levels of body fat even in very young children[67,73]. Finally, the patterns of PA from childhood continue to adulthood, so young children should be encouraged to be involved in some kind of PA or play not only to prevent becoming obese or overweight but also to maintain good health later in life[156].

4.4.2. PA indicators as risk and protective factors for BMI

Demographic and biological factors. In the systematic review of Hinkley and colleagues [48] and the review by Timmons and colleagues [170], sex was found to be positively associated with physical activity in preschool children, with boys being more physically active compared to girls. No association was found with preschoolers' age, ethnicity, body composition (BMI), and socio-economic status (SES) [48,170]. An indeterminate result was found for parental BMI [48], but a negative association was found [170] with preschoolers having a decrease in physical activity when their father's BMI increased.

Behavioral factors. Television viewing was the most investigated behavioral factor in preschool children, with some studies showing a negative association with physical activity (more television viewing means less time for physical activity), and studies showing no association; resulting in indeterminate results [48]. According to a systematic review on behavioral factors of preschoolers' sedentary behaviors [171], an indeterminate result was found for the association between physical activity and television viewing. Furthermore, no association was found between outdoor play time and preschoolers' time spent watching television. In addition, energy intake was positively associated with preschoolers' television viewing with preschoolers watching more television when they have a higher energy intake [171].

Social and cultural factors. The association between parental physical activity and preschoolers' physical activity was the most studied social factor in this age group. A positive association was found for parental physical activity, which means that preschool children are more likely to be physically active if their parents are physically active[85,171]. In addition, parental encouragements and parental discouragements were not associated with preschoolers' physical activity levels [171], while a negative, inverse association between preschoolers' TV viewing and parental rules about TV time was found, which means that preschool children experiencing more rules about their television time will spend less time watching television [123].

4.5. PA variations among native and immigrant preschoolers

Socioeconomic background and ethnicity is tightly linked with differences and inequalities in children's lifestyle behaviors associated with eating patterns, as well as physical activity participation levels. Adverse lifestyle behaviors such as excessive amounts of television viewing, breakfast skipping, or lack of participation in sports have been shown to be more common among children from low family SEP and children from ethnic minority groups[172,173]. Despite the fact that adverse lifestyle behaviors and inequalities seem to establish around the preschool period[73], most of the studies on the associations of family SEP and ethnic background with children's lifestyle behaviors concern school-aged children and adolescents, thus, less is known on these associations among younger children.

The relation between ethnicity and children's PA has been the research scope in various countries with contradictory results. Immigrant children are sometimes more active[8], according to other findings equally or less active[35] than native children. Moreover, migrants coming from developing countries may exhibit a cultural preference for larger body sizes, considering them as signs of health and wealth, leading the parents to be rather unconcerned about their children's overweight or obesity[3]. Ethnic differences in the prevalence of childhood overweight/obesity, body image and PA have been more extensively investigated in USA, and as a result, European studies on this topic are scarce[3].

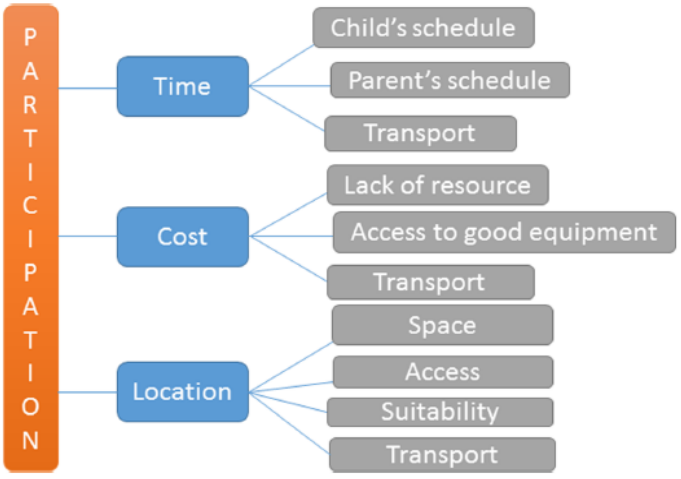
4.5.1. Native and immigrant preschoolers' participation in sports activities in kindergarten and afterschool PA activities

Despite the health benefits of physical activity in early childhood, little is known about sport activity patterns and general physical activity practices in preschool children with different ethnic origins.

Studies on sports participation consistently show that children from families with a low socioeconomic position (SEP) [174,175] and ethnic minority children [172,176]participate less often in organized sports compared with high SEP children and ethnic majority children. Research on the associations of family SEP[175,177] and ethnic background [176,178] with children's outdoor play is scarcer and conflicting, possible due to the use of different indicators of SEP [175,177]. Furthermore, previous research on the associations of ethnic background with children's sports participation and outdoor play have either been conducted in the US [178], which hampers generalization to ethnic minority groups in Europe, or in Europe comparing heterogeneous groups of ethnic minority children (native versus non-native children) [172,176], which hampers effect evaluation for specific ethnic minority groups. As migration histories and cultural backgrounds differ substantially between children from different ethnic minority groups, these children may display very different physical activity behaviors.

A very recent, 2018 study depicts that barriers to voluntary participation in children to sports activities[179], as can be seen in the following figure 2, are attributed to time, cost and location.

Figure 2: Practical barriers to participation to sports for children



In a recent, 2014, study in ethnically diverse 6-year-old children participating in the Generation R Study, a multi-ethnic prospective birth cohort in Rotterdam[180], socioeconomic inequalities in children's sports participation were found linked with maternal educational level, paternal educational level, maternal employment status, as well as household income. All ethnic minority children were significantly more likely to not to participate in sports and play outdoor <1 hour per day compared with native Dutch children.

In another study, sports activities were significantly more frequent in native preschoolers Italian girls than in native Italian boys and immigrant girls. that the weekly amount of club-organized sport in preschool children was related to the sex and migrant status in the whole sample, to paternal educational level and occupation in the native-born sample and to paternal body mass index, offspring and paternal occupation in the immigrant group[36]. Previous researches[76,176] demonstrate that native-born children have greater participation in club sports – namely planned sports activities led by staff - than immigrant children.[76]

Making sport activities for children freely accessible and monitoring this practice in time would be important for the promotion of healthy behaviors of immigrants, minority groups and the whole population. Schools should consider extra-curricular activities as another opportunity to profitably develop the motor activity of the child, explaining the importance of exercise to parents, promoting a healthy lifestyle and also encouraging participation in extracurricular activities by the children of immigrants. Reducing financial barriers to activities, especially for children, could be a beneficial consequence of improving sports participation for low socio-economic groups.

Further longitudinal studies are needed, using larger samples of immigrant children of preschool and school age[36]. An important public health message should be the idea of PA "investment". This study highlighted the need to develop specific interventions for native and immigrant preschool children to promote a healthy, active lifestyle.

4.6. Greek strategies and national policies towards raising awareness on physical activity necessity and active participation

According to WHO 20018 physical activity fact sheet for Greece [181], in the following national policies are being implemented for the promotion of physical activity participation, targeting more age groups.

Implementation of "National school day" program

A "National school day" was implemented for the first time in 2014 and is repeated on the first Monday of October every year in all schools in Greece, involving all teachers and pupils. About 850.000 students in 7000 schools take part in organized sports events inside and outside the school area. The event takes a long-term, holistic approach to promoting health and quality of life, with the broad goal of achieving public health and economic benefits for the country.

- **The "Sports for all" program**

The aim of the "Sports for all" program in Greece is to provide opportunities for the entire population to be physically active. It includes programs for people with disabilities, preschoolers, children and older adults and also in mental health facilities, prisons and as part of drug rehabilitation. The program is funded by the General Secretariat of Sports and is being implemented nationwide. Sports-for-all programs are delivered to older adults as an opportunity to exercise and are conducted in cooperation with municipalities, foundations and sports clubs. Two sport events have also been held: the "World senior games" for people aged ≥ 50 years in in 2017 and the "4XF for silver safety" in 2016.

- **The "Different people – common needs program for refugees**

The aim of the "Different people – common needs: refugees moving towards a physically active life" program is to support refugees in being physically active. The program was established in 2016, is coordinated by the Directorate of Physical Education and is funded by the European Union. It provides two 3-h sessions of physical activity per week for people aged 15–30years living in refugee camps in Athens.

A desirable goal would be, if that program focusing on refuges aged 15–30years could also be designed and implemented by educators and health policy professionals to younger children, in order to give them the opportunity of free access to meaningful, enjoyable, playful PA suitable for younger children.

Chapter 2

Research Methodology

CHAPTER 2: RESEARCH METHODOLOGY

Introduction

The previous chapter presented the literature review and conceptual framework. This chapter delineates the research methodology. It presents analytically the basic parts of Materials and Methods; Study design and participants, Inclusion and exclusion criteria, Ethical issues, Processes and tools, Anthropometrical & Lifestyle Measurements, Evaluation of dietary habits, Physical activity assessment. Information on Statistical analysis procedures and techniques is also presented.

Material and Methods

Study design and population

This cross-sectional study was conducted in Attica region (largest administrative region in Greece, including the capital city), during the school year 2016-2017. The study population consisted of preschoolers aged 5 to 6 years and their family (i.e. guardian parent), attending kindergarten located in the region of Attica (including the capital city of Athens).

For the aims of this study we adopted the definition of an ethnic group or population as "a group of people smaller in number than the majority categories, who by their customs, language, race, values, and group interests differ from the majority population" [38]. The framework of ethnicity in our study, similarly to other cross-sectional studies [182], was defined according to the country of birth of the preschoolers as well as that of their guardian parents. Specifically, a participant was considered of *non-Greek ethnicity* if either of the following criteria was fulfilled: (1) born outside Greece and at least one parent born outside Greece (i.e., first generation); or (2) born in Greece, but both parents born outside Greece (i.e., second generation) and migrated in Greece.

Several *inclusion criteria* were formed as follows: a) Permanent residents in Attica (at least the last 2 years, irrespective of ethnicity), b) Registered in the selected kindergartens, b) speaking and comprehending the Greek language regardless ethnicity). Preschoolers not attending the

extended educational program (from 8.15 a.m. to 16 p.m.) were excluded in order to ensure that all participants (preschoolers) would eat lunch during school hours.

A geographically representative sample of kindergartens was achieved upon a kind invitation of all active facilities in the study region (Figure 1). A total of 63 kindergartens located in 36 municipalities within the Attica region, situated both at the suburbs and in the center of capital city (Athens), were randomly selected from a list provided by the Hellenic Ministry of Education. Furthermore, five hundred and seventy-eight (n=578) guardian parents of preschool children, both native Greeks (n=451) and other nationalities (n=127) -attending the enrolled kindergartens- were included in the study. Families of other nationalities originated from: Egypt (n=1), Ethiopia (n=1), Albania (n=79), Bulgaria (n=2), Georgia (n=3), Indonesia (n=1), Jordan (n=1), Kazakhstan (n=3), Canada (n=1), Morocco (n=1), Moldova (n=2), Nigeria (n=2), Hungary (n=1), Uzbekistan (n=1), Ukraine (n=2), Poland (n=7), Romania (n=9), Russia (n=3), Sudan (n=1) and Syria (n=1).

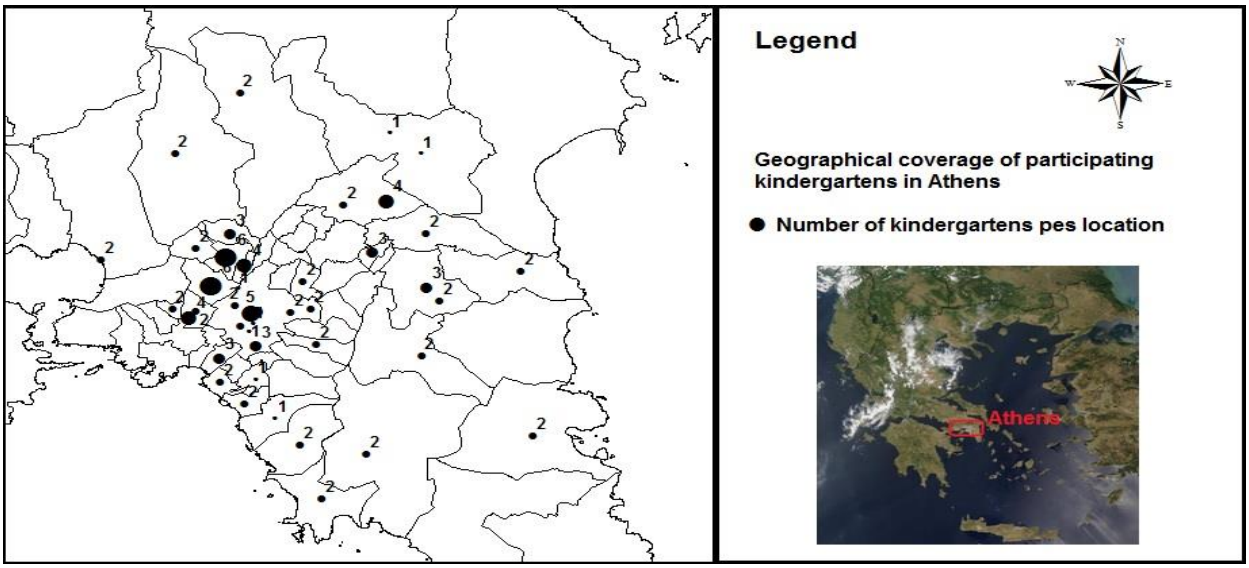


Figure 3: Geographical coverage of participating kindergartens in Attica

Ethical issues

The study was designed and carried out according to the principles of Helsinki Declaration (1989) and approved by the Research Department of the Education Institute of the Hellenic Ministry of Education (approval F15/1774/222145/2016) [Appendix 1, p.140].

Questionnaires were distributed and filled in by the guardian parents during kindergarten hours. All kindergartens were extensively informed for the purposes and processes of this study and provided written approval (a/a: 03/10/2016). A well-trained researcher from the authorship was responsible for the coordination and performance of this survey, while collaboration of the kindergarten's directors was substantial for the contact with the parents. All guardian parents were also informed and provided consent forms before the initiation of the survey(Appendix 2, p.141).

Processes and tools

Three separate but similarly structured questionnaires were used in preschoolers and guardian parents respectively. These questionnaires were a composition of four already validated tools; The 'Rhea follow-up FFQ' [183], which is a validated semi-quantitative food frequency questionnaire designed to assess habitual dietary intake in preschoolers, the Food Frequency Questionnaire (FFQ) (frequently tested and utilized in Greek settings) [184], the Physical Activity Questionnaire in preschoolers (developed by Rhea study and tested in Greek settings) [185], while the Mediterranean Diet Quality Index (KIDMED) [129] was also incorporated in the final questionnaire to measure adherence to the Mediterranean style diet among preschoolers: the principles either sustaining healthful, Mediterranean-style dietary patterns (e.g. daily consumption of fruit and vegetable, weekly fish and legumes intake), or opposing to the Mediterranean-style dietary pattern (e.g. intake of fast food, increased consumption of sweets) [129]. KIDMED is a short questionnaire consisting of 16 questions with dichotomous answers (yes/no), grading the overall adherence of the subject. The domains included in the index are fruit, vegetable, fish, pasta/rice, cereals, yoghurt/cheese and nuts consumption, dairy and commercial baked goods breakfast intake, skipping breakfast frequency, fast-food, sweets and candy intake, as well as the use of olive oil at home. Twelve of the questions have the possibility

of increasing the score (+1 point) based on good dietary practices according to the MD protocol, whereas the remaining four questions of decreasing it −1 point). Thus, the maximum possible score is 12, whereas the lowest is 0. The overall score is graded in three levels: (1) KIDMED≥8 is indicative of the optimal MD; (2) a score between 4 and 7 shows that improvement is needed to adjust intake according to the Mediterranean dietary patterns and (3) a score≤3 stresses the adoption of a very low diet quality.

Overall, four (4) main sections composed the final version of these tools, with information on: family's sociodemographic profile (gender, age, place of residence, duration of living in Greece, parental educational level and profession), guardian parent's weight, height, lifestyle habits (including smoking, alcohol consumption, physical activity), family's nutritional habits and cooking choices, preschooler's weight, height, nutritional habits all day long at home and during kindergarten, adherence to the Mediterranean diet, physical activity and television (TV) watching.

The questionnaires were distributed and filled in by the guardian parents during kindergarten hours.

More specifically, through the evaluation and use of the processes and tools mentioned above, we intended to collect the following research data:

Anthropometrical & Lifestyle Measurements

Data regarding families' demographic characteristics and profile, such as parent's age, ethnic group, employment status and years of education were collected by the use of the validated Food Frequency Questionnaire (FFQ) [184]. Additional anthropometrical data were obtained by preschoolers' parents, such as current height and body weight of each parent and his/her child. Both parents' and children's BMI was, thus, recorded and calculated. Parents body height (m) and weight (kg) were self-reported and used to calculate parents BMI (kg/m2) and to define parents overweight (BMI 25–29.9 kg/m2) and obesity (BMI P30 kg/m2), according to the World Health Organization classification for adults.

BMI as weight (Kg) ratio to squared height (m2) was calculated for each child. To determine overweight and obesity, BMI percentile and CDC were used. BMI between 85 and 95

percentiles, (for age and sex), was accounted as overweight and greater than 95 is defined as obese.

Additional lifestyle information was obtained by parents regarding their smoking and alcohol consumption, as well as perceptions and concerns regarding their children's current eating behaviors, weight status.

Evaluation of dietary habits

Two separate but similarly structured questionnaires were used in preschoolers and parents respectively. These questionnaires were a composition of two validated tools; the Food Frequency Questionnaire (FFQ) [184] and the Mediterranean Diet Quality Index (KIDMED)[129]. The KIDMED score [46] measured adherence to the Mediterranean style diet among preschoolers, based on the principles sustaining healthful, Mediterranean-style dietary patterns (e.g. daily fruit and vegetable consumption, weekly fish and legumes intake), as well as on those that do not support the Mediterranean-style dietary pattern (e.g. frequent intake of fast food, increased consumption of sweets). Other aspects of eating behavior were also evaluated, such as eating at least one family meal per day, frequency of eating home-delivered food, breakfast consumption, eating while engaged in other activities (e.g. television viewing).

Furthermore, the FFQ was selected as a validated semi-quantitative food frequency questionnaire designed to assess habitual dietary intake in preschool children [183]. Primary caregivers were asked to complete the questionnaire, which contained questions on 118 food items with the following components: food frequency, type of meals during the day (breakfast, morning snack, lunch, afternoon snack, dinner and evening snack), use of dietary supplements, type of fat used for cooking, frequency of meals consumed in restaurants or take away and television viewing during meals. The 118 food items were combined into 16 food groups (milk and milk products, cereals and cereal products, eggs, meat and meat products, fish and seafood, lipids, olive oil, potatoes and other starchy roots, pulses, vegetables, nuts, fruits, sugar preserves and confectionery, beverages with no alcohol, olives, salty snacks and other miscellaneous). Guardian parents could choose from one or two portion sizes and report the

child's intake in terms of times per day, week, month and year, even never. In all food items seasonality of consumption was also reported.

Physical activity assessment

Information on guardian parents' and preschoolers' physical activity levels was obtained by a valid, structured Physical Activity Questionnaire (developed by the Rhea Study, University of Crete) [185]. Questions included information on parents' frequency of physical activity (alone or together with their children), type, duration, and intensity of the child's participation in all typical school outdoor organized or non-organized Light to Vigorous Physical Activities (L-VPA). Furthermore, Physical Activity Questionnaire assessed the amount of time guardian parents spent watching TV and/or playing computer games during a typical day/week for themselves and their child.

Statistical analysis

Analysis was conducted in the IBM SPSS 24.0., while all tests were two-tailed and performed with statistical significance set at a p=0.05. Distributions of all variables were tested by Kolmogorov-Smirnov and binomial chi-square; indicating a normal distribution in most cases. Descriptive statistics were exported and demonstrated using N (%) for categorical variables and Mean (Standard Deviations, SD) for scale variables. Furthermore, chi-square, Mann-Whitney and Student's t tests were performed to identify potential differences between native Greeks and ethnicity minority groups (no additional statistics per minority ethnicity group are presented due to small number of cases in the sub-groups).

Furthermore, two new variables were created based on parents' and preschoolers' dietary habits, using empirical grouping of dietary habits questions and checking the final grouping by cluster analysis. Lastly, mathematical weights were provided to rank least and best patterns of dietary habits per category (parents or children). Additionally, the correlation coefficient was estimated using Pearson's rho in order to assess the level of concordance and correlation of these two variables; preschoolers' BMI and selected child's and guardian parents' indicators.

Special focus was given on the development of two multivariate models that could predict preschooler's BMI and one model predicting low KIDMED score based on preschoolers and parent's habits. All models were adjusted for confounders including preschooler's age, parents' profession and nationality.

Furthermore, classification of BMI, calculated as the weight over the squared height (kg/m2), was attempted (i.e. underweight, normal, at risk of underweight, overweight, obese) [186]. Nevertheless, no statistical comparisons were possible due to the fact that all preschoolers were found to have normal BMI.

Lastly, a linear regression model was developed to assess risk of increased BMI due to PA indicators. The model was adjusted to ethnicity. Lastly, a new variable was computed and is presented under the name "physical activity"; considering all PA questions on frequency of TV watching, indoor and outdoor playing activities using the weighted mean formula.

The questionnaires used in the research study are presented in Appendix3, p.143 and Appendix 4, p.157.

Chapter 3

Results

CHAPTER TREE: RESULTS

This chapter presents findings obtained from the field. The Results for this study are presented on the basis of the research aim, questions and hypotheses.

Research aim and objectives:

To assess Greek and immigrant preschoolers and their families regarding body mass index (BMI), nutritional habits and adherence to the Mediterranean diet (KIDMED score).

To investigate the individual and parental dietary and lifestyle factors associated with OW/OB among preschoolers in Athens, Greece.

1st Research question

Family's lifestyle impact on Greek and different nationality preschoolers' dietary habits and BMI during the austerity period in Attica, Greece.

Sub-Research Questions:

Which are the current levels and potential variations of BMI among native and immigrant preschoolers in Attica region?

Are there any differences between their nutritional and lifestyle habits? To what extend do family and individual lifestyle habits affect BMI and adherence to the Mediterranean diet?

3.1. Participants' demographic profile

Research Hypothesis

As ethnic subgroups are often minority groups with a lower socioeconomic position than the main ethnic group within a country, we hypothesized that families' sociodemographic characteristics and profile would vary according to nationality

According to our research results, *gender* and *age* of the participating families were *almost similar* between Greeks and those of other nationalities, reflecting the homogeneous demographic background. The vast majority of the participants guardian parents were females (mothers) (Greeks: 81.2% and other nationalities: 77.1%) with mean age 38.2 and 35.1, respectively. Similarly, mean number of children attending kindergarten was 1.4, regardless nationality. Lastly, this child often was the fifth in order within the family.

However, in accordance with our research hypothesis that families' sociodemographic characteristics and profile would vary according to nationality, our results depicted that *place of*

residence, *educational level* and *profession* varied significantly (p value<0.001) between Greek and other nationalities. The majority of Greeks were residing in West Attica (32.2%), whereas those of other nationalities were in the main center of Athens (52.5%). Participants' demographic profile is presented in **Table 1**.

Table 1: Family' demographic profile according to nationality (n=578)

Characteristics	**Nationality N (%)**		**P value[a]**
	Greeks N=451	**Other nationality N=127**	
Gender (participant)			0.31
Males	85 (18.8)	29 (22.8)	
Females	366 (81.2)	98 (77.1)	
Age (Mother)	38.2 (4.3)	35.1 (5.3)	0.4
Age (Father)	40.6 (5.0)	39.1 (6.4)	0.6
Place of residence			<0.001
Athens	74 (17.4)	64 (52.5)	
North suburbs of Athens	72 (16.9)	3 (2.5)	
South suburbs of Athens	74 (17.4)	14 (11.5)	
East Attica	69 (16.2)	14 (11.5)	
West Attica	137 (32.2)	27 (22.1)	
Years of stay in Greece*	-	16.6 (5.6)	-
Parent's level of education			<0.001
Primary school	1 (0.2)	13 (10.6)	
Junior high school	10(2.2)	20 (16.3)	
High school	199 (44.1)	60 (48.8)	
University degree	162 (35.9)	26 (21.1)	
Master/PhD	79 (17.5)	-	
Profession (father)			<0.001
Unemployed	16 (3.6)	20 (16.1)	
Free lancer	100 (22.6)	24 (19.4)	
Public sector	319 (70.2)	64 (61.2)	
Private sector	16 (3.6)	19 (3.3)	
Profession (mother)			<0.001
Unemployed/housewife	47 (10.5)	27 (21.3)	
Free lancer	31 (6.9)	15 (11.8)	
Public sector	362 (80.1)	74 (65)	
Private sector	11 (2.5)	11 (1.9)	
Number of female children*	1.4 (0.5)	1.3 (0.6)	0.12
Number of male children*	1.4 (0.5)	1.4 (0.6)	0.20
Female children in kindergarten*	1.0 (0.1)	1 (-)	0.31
Male children in kindergarten*	1.0 (0.3)	1.1 (0.5)	0.34
Child's age (kindergarten)*	5.1 (0.5)	5.1 (0.6)	0.99
Child's order in family (kindergarten)			0.99
Older (single or twins)	275 (60.9)	73 (57.5)	
Middle	168 (37.3)	53 (41.7)	
Younger	8 (1.8)	1 (0.8)	

*Mean (SD)

a chi-square, Mann-Whitney and Student's t test

3.2. Guardian parent's obesity (BMI) and lifestyle factors (smoking status, alcohol consumption, physical activity) according to nationality

Research Hypothesis
1. *Differences would be observed in BMI rates between Greeks and non-indigenous guardian parents.*
2. *There would be variations in lifestyle habits between Greek and other ethnicity guardian parents', such as levels of smoking status alcohol consumption, levels of physical activity.*

Contrary to our research hypothesis, guardian parent's obesity characteristics didn't vary, since mean *BMI* was 24.9 (13.2) in Greeks and 24.8 (4.5) in other nationalities (between limits of normal and overweight).

It should also be noted that 72.1% of the "other nationalities" stated that gained weight upon stay in Greece (approximately 12 kg), mainly due to pregnancy or other reasons related to *low physical activity*, *disease* and *anxiety*.

On the other hand, our research hypothesis that there would be variations in lifestyle habits between Greek parents' and other ethnicity guardian parents', is confirmed, as according to our results, there *are variations in the levels of smoking status, alcohol consumption, levels of physical activity* between the guardian parents, according to nationality. Measuring ***parental smoking activity***, approximately 35% of both participating groups were smokers, with *Greeks* presenting significantly (p value=0.03) *longer smoking activity* (16.1 years) comparing to other nationalities (12.2 years). Furthermore, level of ***alcohol consumption*** varies between the guardian parents (p value=0.05), with more Greek parents (66.7%) declaring consuming alcohol than parents of other nationalities (23.8%). Additional variations were observed in ***physical activity*** (p value=0.004), with *the majority of other nationalities' parents being active* (71.7%), while *Greek parents being inactive* (42.5%). **Table 2** presents other characteristics of the participating guardian parents compared between nationalities (Greeks versus other nationality).

Table 2: Guardian parent's obesity and lifestyle factors, according to nationality (n=578)

Characteristics	Nationality N (%)		P value[a]
	Greeks N=451	Other nationality N=127	
Weight*	69.0 (15.06)	70.3 (13.4)	0.7
Height*	1.7 (0.11)	1.8 (0.9)	0.8
BMI*	24.9 (13.2)	24.8 (4.5)	0.8
Gain weight			-
No	-	34 (27.9)	
Yes	-	88 (72.1)	
Weigh gained (kg)*	-	12.76 (6.9)	
Frequent causes of gaining weight			
Eating more	-	20 (15.7)	
Time/age	-	12 (9.4)	
Pregnancy	-	39 (30.7)	
Other (low physical activity, disease, anxiety)	-	29 (44.2)	
Smoking status			0.81
Never smoker	292 (64.7)	81 (64.8)	
Ever smoker	159 (35.3)	44 (35.2)	
Pack/days*	1.92 (0.9)	2.1 (1.1)	0.32
Years of smoking*	16.1 (5.5)	12.2 (6.2)	0.03
Alcohol consumption			0.05
No	300 (66.7)	96 (76.2)	
Yes	150 (33.3)	30 (23.8)	
Glasses of alcohol/week			0.05
One	87 (58)	15 (50)	
Two	43 (28.7)	9 (30)	
>2	20 (13.3)	6 (20)	
Physical activity			0.004
No	258 (57.5)	36 (28.3)	
Yes	191 (42.5)	91 (71.7)	
Frequency of physical activity			0.84
Once or twice/week	132 (43.7)	25 (30.3)	
More than twice/week	55 (18.2)	11 (17.7)	

*Mean (SD)

a chi-square, Mann-Whitney and Student's t test

3.3. *Preschoolers' obesity and dietary differences between the two nationality groups; preschoolers' BMI, Adherence to the Mediterranean Diet and KIDMED score*

Research Hypothesis

1. *Differences would be observed in BMI rates between Greek and non-indigenous preschoolers.*
2. *Differences between Greek and immigrant preschoolers would be observed in the sub-categories of KIDMED score measuring Mediterranean diet habits.*
3. *Greek preschoolers, despite the economic difficulties of the Greek austerity period, would follow healthier nutritional habits compared to their immigrant peers, whose nutritional lifestyle would be expected to be closer to their culture food choices.*
4. *Preschoolers of other ethnicities would present lower levels of adherence to the Mediterranean diet comparing to their native Greek peers.*

Neither our research hypothesis concerning preschoolers' BMI, nor the one concerning children's KIDMED Score were verified; as presented in Table 3, BMIdidn't vary since it was 15.7 and 15.8 (normal/healthy weight) in Greeks and those of other nationalities, respectively.

Similarly, KIDMED score was "poor" in the majority of both groups (Greeks: 85.8%, other nationalities: 87.4%, p value=0.7).

Nevertheless, *several differences were observed in the sub-categories of KIDMED score measuring Mediterranean diet habits*. In particular, more children of other nationalities consume fish regularly (p value=0.04) and visit more than once per week a food restaurant, comparing to Greek children (p value<0.001). Furthermore, the 70.9% of the children of other nationality consumes pasta or rice almost every day (Greek: 56.2%, p value<0.001), the 80.2% of them have cereals or grains for breakfast (Greek: 69.8%, p value=0.02). Significantly less (p value<0.001) Greek children skip breakfast (10.9%) comparing to other nationalities (29.4%), whereas more Greeks use olive oil at home (Greek: 99.6%, other nationalities: 94.5%, p value<0.001). In addition, the 18.4% of other nationalities chooses commercially baked goods or pastries for breakfast (Greek: 9.1%, p value=0.003) and the 37% takes two yoghurts and/or 40g cheese daily (Greek: 50.2%, p value=0.008).

The above results are presented in **Table 3**, as follows.

Table 3: BMI and KIDMED score in preschoolers of different nationalities

Characteristics	Nationality N (%)		p value[a]
	Greeks	Other nationality	
BMI*	15.7 (2.2)	15.8 (3.3)	0.06
Adhesion to Mediterranean diet *(positive responses)*			
Takes a fruit or fruit juice every day	394 (87.4)	111 (88.1)	0.8
Has a second fruit every day	216 (48.3)	58 (45.7)	0.6
Has fresh or cooked vegetables regularly once a day	306 (67.8)	83 (65.4)	0.6
Has fresh or cooked vegetables more than once a day	110 (24.6)	27 (31.3)	0.5
Consumes fish regularly (at least 2–3/week)	88 (19.5)	21 (24.4)	0.04
Goes >1/ week to a fast food restaurant (hamburger)	10 (2.2)	18 (14.2)	<0.001
Likes pulses and eats them >1/week	298 (66.1)	75 (59.1)	0.1
Consumes pasta or rice almost every day (5 or more per week)	253 (56.2)	90 (70.9)	<0.001
Has cereals or grains (bread, etc) for breakfast	315 (69.8)	101 (80.2)	0.02
Consumes nuts regularly (at least 2–3/week)	110 (24.4)	29 (23.0)	0.7
Uses olive oil at home	448 (99.6)	120 (94.5)	<0.001
Skips breakfast	49 (10.9)	37 (29.4)	<0.001
Has a dairy product for breakfast (yoghurt, milk, etc)	421 (93.3)	117 (92.1)	0.7
Has commercially baked goods or pastries for breakfast	41 (9.1)	23 (18.4)	0.003
Takes two yoghurts and/or some cheese (40 g) daily	226 (50.2)	47 (37.0)	0.008
Takes sweets and candy several times every day	84 (18.6)	20 (15.9)	0.5
KIDMED score			0.7
Poor	387 (85.8)	111 (87.4)	
Medium	56 (12.4)	15 (11.8)	
High	8 (1.8)	1 (0.8)	

*Mean (SD)

a Mann-Whitney

3.4. Parental and children's individual indicators that significantly correlate with children's BMI.

Research Hypothesis

1.Family's lifestyle would be correlated with preschoolers' BMI in any ethnic group

2. Family's lifestyle would have a strong impact on preschoolers' dietary habits and BMI, regardless ethnicity.

As expected, strong correlations were depicted between child's BMI and several individual or family indicators. *Guardian parent's age and BMI* are positively correlated (p value<0.001) with child's BMI (0.78 and 0.96 respectively), while *guardian parent's lifestyle* seems to have a strong impact on child's BMI, since the less a parent smokes and consumes alcohol, the more normal child's BMI tends to be.

Conversely, *guardian parent's and child's physical activity* are inversely correlated with child's BMI (-0.72, p value=0.03 and -0.96, p value=0.04 respectively). Lastly, *child's high BMI* was revealed to be strongly correlated to low KIDMED score (-0.83, p value=0.01).

Table 4 depicts the *main strongest correlations between child's BMI and several individual or family indicators*.

Table 4: Correlation between child's BMI and selected individual and family indicators

Independent indicators	Child's BMI	
	Correlation coefficient[a]	p value
Parents and familial indicators		
Age	0.78	<0.001
BMI	0.96	<0.001
Smoking habits (pack/years)	0.81	0.02
Alcohol consumption (glasses/week)	0.79	0.03
Physical activity	-0.72	0.03
Child's-Individual indicators		
KIDMED score	-0.83	0.01
Physical activity*	-0.96	0.04

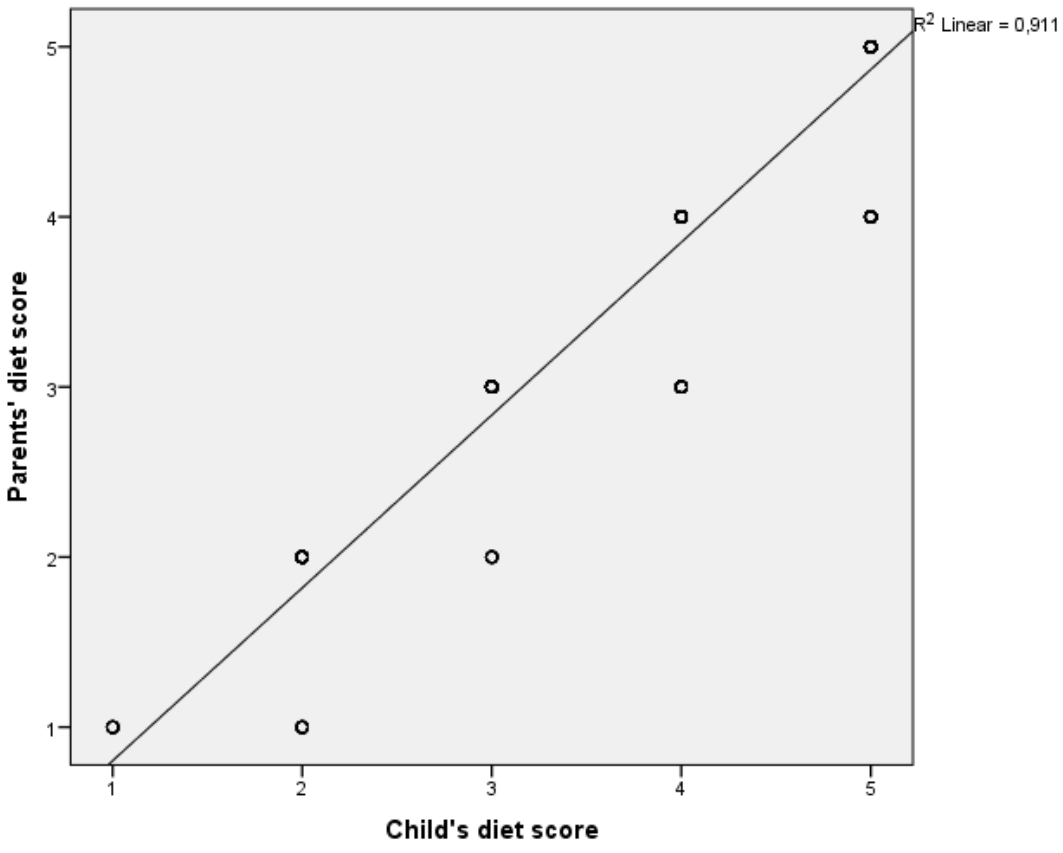
*variable computed based on frequency of TV watching, indoor and outdoor playing activities
a Pearson's correlation coefficient

3.5. Significant high level of concordance of parent's and child's dietary habits, regardless ethnicity.

Research Aim

To explore the level of potential correlation of guardian parents' and preschoolers' dietary habits.

Figure 4 illustrates the level of concordance of parent's and child's dietary habits utilizing the overall diet score in each group. As observed, dietary patterns presented significant correlation (Pearson's rho= 0.94, p value<0.001). More than 90% of child's dietary habits could be explained by parent's choices (R2=0.91).



3.6. Parent's and child's dietary and lifestyle habits compared per nationality group.

Detailed findings on parent's and child's dietary and lifestyle habits per nationality group are presented in **Table5**below.

Table 5: Comparison of dietary and other lifestyle characteristics of the participants of different nationality

	Nationality N (%)		**p value**
	Greeks N=451	**Other nationality N=127**	
Parents' frequency of Mediterranean diet			<0.001
Not at all	13 (2.9)	25 (19.8)	
Rarely	83 (18.5)	53 (42.1)	
Often	314 (70.1)	45 (35.7)	
Very often	38 (8.5)	3 (2.4)	
Parents' breakfast consumption (yes)	342 (75.8)	91 (71.7)	0.3
Children's breakfast consumption (yes)	409 (91.1)	109 (85.8)	0.08
Parents' brunch consumption (yes)	301 (67.2)	44 (34.6)	<0.001
Children's brunch consumption (yes)	425 (94.2)	105 (82.7)	<0.001
Parents' meal consumption (yes)	425 (94.7)	122 (96.1)	0.5
Children's consumption of meal in the afternoon (yes)	395 (87.6)	86 (67.7)	<0.001
Parents' Dinner consumption (yes)	357 (79.2)	111 (87.4)	0.03
Children's dinner consumption	404 (89.6)	115 (90.6)	0.7
Parents' time of dinner			0.2
Don't eat	42 (9.3)	8 (6.3)	
Not at specific time	74 (16.4)	28 (22)	
Before 20.00	70 (15.5)	28 (22)	
At 20.00	87 (19.3)	20 (15.7)	
At 21.00	125 (27.7)	35 (27.6)	
At 22.00	44 (9.8)	7 (5.5)	
After 22.00	9 (2.0)	1 (0.8)	
Children's time of dinner consumption			<0.001
No dinner	19 (4.2)	2 (1.6)	
No specific hour	18 (4)	18 (14.2)	
Before 20.00	144 (31.9)	48 (37.8)	
At 20.00	193 (42.8)	44 (34.6)	
At 21.00	70 (15.5)	13 (10.2)	
At 22.00	7 (1.6)	2 (1.6)	
Parents' frequency of eating at			

fast food restaurants (including souvlakery)			<0.001
Never	104 (23.2)	58 (45.7)	
Rarely	263 (58.6)	58 (45.7)	
Often	82 (18.3)	11 (8.7)	
Once/Twice per month	239 (53)	47 (37)	
Children's Frequency of eating at fast food restaurants			0.4
4 or more times per week	3 (0.7)	2 (1.6)	
2-3 times per week	4 (0.9)	1 (0.8)	
Once per week	76 (16.9)	16 (12.6)	
1-3 times per month	162 (35.9)	47 (37)	
Less than once per month	180 (39.9)	48 (37.8)	
Never	26 (5.8)	13 (10.2)	
Parents' frequency of consuming vegetables and fruits			0.01
Less than once per week	7 (1.6)	-	
At least once per week	41 (9.1)	6 (4.7)	
Three/five times per week	151 (33.5)	31 (24.4)	
Every day	252 (55.9)	90 (70.9)	
Children's frequency of consuming vegetables and fruits			<0.001
Not at all	63 (14)	9 (7.1)	
Once per day	323 (71.6)	82 (64.6)	
2-3 times per day	54 (12)	27 (21.3)	
More than 3 times per day	11 (2.4)	9 (7.1)	
Removing fat from child's meat (prior consumption)			0.02
No	72 (16)	32 (25.2)	
Yes	379 (84)	95 (74.8)	
Parents controlling child's diet			0.01
Never	2 (0.4)	3 (2.4)	
Rarely	6 (1.3)	6 (4.8)	
Relatively often	49 (10.9)	20 (15.9)	
Often	199 (44.1)	49 (38.9)	
Very often	195 (43.2)	48 (38.1)	
Parents' years of smoking	16.1 (5.5)	12.2 (6.2)	0.03
Parents' alcohol consumption (yes)	150 (33.3)	30 (23.8)	0.05
Parents' physical activity (yes)	191 (42.5)	91 (71.7)	0.004
Watching TV while eating (yes)	2.7 (1.5)	3.6 (2.2)	<0.001
Children's physical activity (yes)	334 (74.1)	51 (40.2)	<0.001

3.7. Family and individual dietary and lifestyle habits as predictors of high preschoolers' BMI, applied in both ethnic groups (Greeks and other nationalities).

Research Aim

To investigate the parental dietary and lifestyle trajectories that most strongly predict and determine native Greek and immigrant preschoolers' BMI.

Two core multivariate models were developed to estimate high BMI in children. **Table 6** presents the first multivariate model of the joint impact of eleven indicators in preschoolers of different nationalities in Greece. *Low levels of KIDMED score* (β estimate= -0.8, SE=0.2), *low levels of physical activity* (β estimate= -0.8, SE=0.3), *removing fat from meat prior eating* (β estimate= -0.6, SE=0.2) and *parents' low frequency of following MD* (β estimate= -0.5, SE=0.4) seem to *increase the risk for high child's BMI*, significantly (p value<0.05). Moreover, *high frequency of watching TV while eating* (β estimate= 0.7, SE=0.3), *mother's age* (β estimate= 0.4, SE=0.03) *and BMI* (β estimate= 0.6, SE=0.1) also increase the risk, significantly (p value<0.05). Similarly, higher risk is observed in children whose *parents* are *long-term smokers* (β estimate= 0.2, SE=0.1), (β estimate= 0.3, SE=0.02), *alcohol consumers* (β estimate= 0.1, SE=0.03) and *physically inactive* (β estimate= -0.2, SE=0.09).

Table 6: Multivariate model of predicting high BMI in preschoolers of different nationalities in Greece (Model 1)

Predictors	βestimate[a]	Standard Error	p value
KIDMED score	-0.8	0.2	<0.001
Physical Activity	-0.8	0.3	0.02
Removing fat from meat prior eating	-0.6	0.2	0.03
Watching TV while eating	0.7	0.3	0.04
Mother's age	0.4	0.03	0.03

Parents' BMI	0.6	0.1	0.01
Parents' frequency of following Mediterranean Diet	-0.5	0.4	0.01
Parents' Smoking habits (pack/years)	0.2	0.1	0.03
Parents' years of smoking	0.3	0.02	<0.001
Parents' Alcohol consumption (glasses/week)	0.1	0.03	0.04
Parents' Physical Activity	-0.2	0.09	0.03

a Model adjusted for age, parents' profession, nationality

In the second multivariate model (**Table 7**), several indicators were identified as significant (p value<0.05). Similarly to the first model, the following *parents' characteristics* were found to *increase BMI risk*: *high BMI* and *years of smoking*, *decreased physical activity*, *low frequency of following the Mediterranean nutritional scheme* and *removing fat from meat prior eating*. In addition to these factors, *the latest the time of dinner consumption* (β estimate= 0.8, SE=0.2) and *the highest the number of meals consumed at fast food restaurants* (β estimate= 0.7, SE=0.1), the greatest the risk for high BMI in children.

On the contrary, *consumption of breakfast* (β estimate= -0.9, SE=0.1) *and brunch* (β estimate= -0.8, SE=0.1), *high frequency of consuming vegetables or fruits* (β estimate= -0.6, SE=0.02) and *physically active parents* (β estimate= -0.5, SE=0.1) seemed to *diminish the risk for high BMI in children*. *Lower risk* was also presented *when parents control child's diet* (β estimate= -0.6, SE=0.4).

Table 7: Multivariate model of predicting high BMI in preschoolers of different nationalities in Greece (Model 2)

Predictors	βestimate[a]	Standard Error	p value
Removing fat from meat prior eating	-0.5	0.1	0.02
Consumption of breakfast	-0.9	0.1	<0.001
Consumption of brunch	-0.8	0.1	0.01
Time of dinner consumption	0.8	0.2	<0.001
Frequency of eating at fast food restaurants	0.7	0.1	0.02
Frequency of vegetables or fruits consumption jointly with parents	-0.6	0.02	0.01
Parents controlling child's diet	-0.6	0.4	0.03
Parents' Physical Activity	-0.5	0.1	<0.001
Parents' BMI	0.5	0.2	<0.001
Parents' frequency of following Mediterranean Diet	-0.6	0.03	0.03
Parents' years of smoking	0.4	0.01	<0.001
Parents' Physical Activity	-0.1	0.05	0.04

a Model adjusted for age, parents' profession, nationality

3.8. Predictors of preschooler's KIDMED score, applying for both ethnic groups.

Research Aim

To identify predictors of high and low preschoolers' KIDMED score.

Table 8 summarizes the joint effect of low KIDMED score predictors, adjusting for child's age, BMI and nationality. *Child's increased physical activity* (β estimate= -0.6, SE=0.3) and *parents' frequency of following the Mediterranean Diet* (β estimate= -0.9, SE=0.03) were observed to decrease the risk for low KIDMED score, while *watching TV while eating*, increased children's risk of low KIDMED score (β estimate= 0.5, SE=0.08). Similar trends were observed to preschoolers whose *parents* have a *high BMI* (β estimate= 0.7, SE=0.01) and are *long-term smokers* (β estimate= 0.5, SE=0.4).

Table 8: Multivariate model of predicting low KIDMED score in preschoolers of different nationalities in Greece

Predictors	β estimate[a]	Standard Error	p value
Children's Physical Activity	-0.6	0.3	0.02
Watching TV while eating	0.5	0.08	<0.001
Parents' BMI	0.7	0.1	0.01
Parents' frequency of following Mediterranean Diet	-0.9	0.03	<0.001
Parents' years of smoking	0.5	0.4	0.03

a Model adjusted for age, BMI, nationality

3.9. Observed variations between ethnicity groups concerning preschoolers' BMI and PA habits.

Research Aim

To assess the impact of vigorous physical activity and sedentary behavior on preschoolers' body mass index; the role of ethnicity

Research Question

Which are the current levels and potential variations of vigorous PA (outdoor play, sports participation, active transport to/from school) or sedentary behaviors (television viewing, video/DVD and computer game use) among native and immigrant preschoolers in Attica region?

Research Hypothesis

1. Ethnic minority preschoolers would express lower levels of Vigorous PA and higher levels of sedentary PA activities due to less participation in sports activities inside and outside school, as a result of familial time and economic restrictions, barriers and disadvantages, related to SES.

2. Preschoolers of other ethnicity would watch TV more hours daily comparing to Greek, as well as during weekends.

Almost similar BMI was depicted in Greek and other ethnic groups, with significant variations in many PA items. Tables 9 and 10 depict all observed variations between ethnicity groups, BMI and PA habits.

In most cases although *BMI was found to be almost similar* (p =0.06) *between Greek preschoolers* (mean=15.7; SD=2.2) *and their peers of other ethnicity* (mean=15.8; SD=3.3), many PA items varied significantly.

Preschoolers of other ethnicity, in accordance with our research hypothesis, tended to *watch TV* more hours daily comparing to Greeks (mean=2.2 vs 1.6 hours/day, p<0.001), and during weekends (mean=3.6 vs 2.7 hours/day in weekend, p <0.001). Nevertheless, *duration of playing basketball in the kindergarten's yard* was also found to vary significantly (p=0.03) in favor of those of other ethnicity (mean=20.3 minutes/day vs 14.8 minutes/day in Greeks). Similarly, they *played* more (p=0.04) *both in actively and sedentary position in the kindergarten*

(mean=59.5 minutes/day vs 48.4 minutes/day in Greeks). The majority of Greek preschoolers, on the other hand, tend to *play in the playgrounds* (56.7% vs 38.1% in other ethnicities, p<0.001) and have several *scheduled afternoon activities* (74.1% vs 40.2% in other ethnicities, p<0.001). Greeks seemed to have *more intense PA during summer* as well (e.g. swimming, p<0.001) playing at the sand, p=0.02), as well as frequent *skating* (p=0.02). Still they reported less frequently that they went for *calm or intense walk with their parents* (88.2% in other ethnicity vs 66.1% in Greeks). Furthermore, the vast majority of *parents* of Greek preschoolers reported that spent almost no *personal time to facilitate child's physical activity* (mothers: 41.4%; fathers: 39.9%). Although slightly lower proportions were reported by the other ethnicities (mothers: 39.2%; fathers: 35.8%) in "almost no time" response, more of them tend to offer at least ½ hour/week (mothers: 11.2%; fathers:17.5%) or 1 hour/week (mothers: 12.8%; fathers: 13.3%) and more than 7 hours/week (mothers: 6.4%; fathers: 6.6%).Findings of significant variations on PA trends per ethnicity group are presented in **Table 9** and **Table 10**.

Table 9: Physical activity of preschoolers of Greek and other ethnicity (part 1)

Preschoolers' Physical activity	**Ethnicity N (%)**		**p value[a]**
	Greeks	**Other ethnicity**	
BMI*	15.7 (2.2)	15.8 (3.3)	0.06
TV watching, daily (hours)*	1.6 (0.8)	2.2 (1.3)	<0.001
TV watching in weekends (hours)*	2.7 (1.5)	3.6 (2.2)	<0.001
Sedentary games, daily (hours)*	1.8 (0.8)	1.9 (1.2)	0.03
Sedentary games in weekends (hours)*	2.8 (1.5)	3.1 (1.9)	0.03
Playing basketball in kindergarten yard			
Duration (minutes/day) *	14.8 (5.9)	20.3 (11.9)	0.03
Playing both actively and in sedentary position in kindergarten			
Duration (minutes/day) *	48.4 (38.7)	59.5 (53.8)	0.04
Playing actively in kindergarten			0.03
Yes	275 (61.8)	91 (72.2)	
No	53 (11.9)	6 (4.8)	
Don't know	117 (26.3)	29 (23)	
Duration (minutes/day) *	50.5 (18.3)	58.7 (36)	0.04
Playing in the playground			<0.001

Yes	255 (56.7)	48 (38.1)	
No	155 (34.4)	68 (54)	
Don't know	40 (8.9)	10 (7.9)	
Scheduled afterschool activities			<0.001
Yes	334 (74.1)	51 (40.2)	
No	117 (25.9)	76 (59.8)	
Most frequent afterschool activities			0.001
Basketball	9 (2)	2 (1.6)	
Football	25 (6.4)	6 (4.7)	
Ballet/dancing	70 (15.5)	12 (9.5)	
Gymnastics/running	48 (10.7)	2 (1.6)	
Martial arts	34 (7.8)	8 (6.3)	
Duration (days/week) *	3 (0.5)	1 (0.5)	0.04
Playing at playground after school, intensively (Days per week) *	4 (0.5)	2 (0.5)	0.01
Swimming in the beach during summer (days/week) *	4 (0.2)	2 (0.3)	0.001
Playing at the sand while being at the beach (days/week) *	3 (0.4)	2 (0.2)	0.02
Cycling			0.05
Yes	379 (84)	96 (75.6)	
No	72 (15.3)	31 (24.4)	

*Mean, SD

[a] chi-square, Mann-Whitney and Student's t tests were performed

Table 10: Physical activity of preschoolers of Greek and other ethnicity (part 2)

Physical activity	**Ethnicity N (%)**		**p value[a]**
	Greeks	**Other ethnicity**	
Going for calm or intense walk with the parents			<0.001
Yes	298 (66.1)	112 (88.2)	
No	153 (33.9)	15 (11.8)	
Skating			0.02
Yes	224 (49.7)	46 (36.2)	
No	227 (50.3)	81 (63.8)	

Playing location outdoors			0.03
Playground	349 (77.6)	107 (84.3)	
Pavement	3 (0.7)	3 (2.4)	
Play yard of kindergarten	50 (11.1)	5 (3.9)	
Park	48 (10.7)	12 (9.4)	
Total time of mother, offered to child's physical activities			0.08
Almost no time	186 (41.4)	49 (39.2)	
½ hour/week	48 (10.7)	14 (11.2)	
½ hour to 1 hour/week	56 (12.5)	16 (12.8)	
1-2 hours/week	75 (16.7)	20 (16)	
2-4 hours/week	50 (11.1)	16 (12.8)	
4-7 hours/week	21 (4.7)	2 (1.6)	
More than 7 hours/week	13 (2.9)	8 (6.4)	
Total time of father, offered to child's physical activities			0.004
Almost no time	176 (39.9)	43 (35.8)	
½ hour/week	51 (11.6)	21 (17.5)	
½ hour to 1 hour/week	44 (10)	16 (13.3)	
1-2 hours/week	68 (15.4)	16 (13.3)	
2-4 hours/week	46 (10.4)	9 (7.5)	
4-7 hours/week	32 (7.3)	7 (5.8)	
More than 7 hours/week	24 (5.4)	8 (6.6)	
Mother: Time watching TV or using computer during free time (per week)			<0.001
Not at all	88 (19.6)	15 (12)	
<1 hour	192 (42.8)	39 (31.2)	
1-2 hours	131 (29.2)	51 (40.8)	
3-4 hours	24 (5.3)	9 (7.2)	
>4 hours	14 (3.1)	11 (8.8)	
>4 hours	29 (6.5)	7 (6)	

*Mean, SD

[a] chi-square, Mann-Whitney and Student's t tests were performed

3.10. Parent's views on children's nutritional habits and child's current weight

According to our research results on guardian parent's responses on child's core nutritional habits and their views on child's current weight, *more parents* ($p<0.05$) *of other ethnicity reported that the child: eats more when is anxious/stressed* (7.1% vs 2.9% in Greeks), *asks for drinks and refreshments frequently* (47.2% vs 30.6%), *enjoys tasting new food* (32.3% vs 22.6%), if allowed, *would eat much more quantities/food* (11% vs 7.3%), *looks forward to lunch time* (22.1% vs 5.3%), *even he/she is not hungry parents would try to provide food* (37.9% vs 34.3%) and *would drink something all day long* (37.9% vs 34.3%).

On the contrary, more Greek parents reported ($p<0.05$) that the child: has to eat all food in his/her dish (45.6% vs 44.1%) and if parent doesn't control child's diet, the child would eat less than necessary (46.2% vs 41.7%).

Guardian parent's responses on child's core nutritional habits and their views on child's current weight are presented below in **Table 11**.

Table 11: Differences of child's dietary habits between Greek and other ethnicity

Child's Dietary habits	Ethnicity N (%)		p value[a]
	Greeks	Other ethnicity	
Eats more when is anxious/stressed	13 (2.9)	9 (7.1)	0.02
Asks for drinks and refreshments frequently	138 (30.6)	60 (47.2)	0.02
Eats late in the day	252 (55.9)	59 (46.5)	0.008
Enjoys tasting new food	102 (22.6)	41 (32.3)	0.04
Asks for food all the time	86 (19.1)	28 (22)	0.3
If allowed, child would eat much more quantities	33 (7.3)	14 (11)	0.01
Likes a wide variety of food	203 (45.1)	32 (25.1)	0.03
Looks forward to lunch time	94 (5.3)	28 (22.1)	0.01
If possible, child would drink something all day long	69 (15.4)	38 (29.9)	0.008

Has to eat all food in his/her dish	205 (45.6)	56 (44.1)	0.04
Even when child is not hungry, parent tries to provide food	154 (34.3)	48 (37.9)	0.02
If parent doesn't control child's diet, child eats less than necessary	208 (46.2)	53 (41.7)	0.009
Parent's views on child's current weight			0.9
Very low weight	9 (2)	4 (3.1)	
Low weight	51 (11.3)	15 (11.8)	
Normal weight	367 (81.4)	102 (80.3)	
High weight	22 (4.9)	5 (3.9)	
Very high weight	2 (0.4)	1 (0.8)	

[a] chi-square test was performed

3.11. Observed associations between physical activity and body mass index

Moreover, several correlations (Pearson's r) were identified between child's BMI and selected PA and behavioral indicators, in Greek and other ethnicity groups (**Table 12**). Similar medium or strong associations were observed in both ethnic groups, with the statistically significant ones being reported in Table 12 (p=0.04).

Overall, *PA was inversely correlated to BMI* (i.e. the less they exercise the more increased BMI), with a correlation coefficient of -0.97 in Greek ethnicity and -0.95 in those of other ethnicity. *Parameters that tended to have the strongest proportional correlations with BMI* were: TV watching daily and in weekends. *Strongest inversely proportional associations were noticed in*: physical exercise/participation in music-dance games, playing actively in kindergarten and scheduled afterschool activities. Lastly, mother's time spend in watching TV or using the computer seemed to increase child's BMI (Greek: 0.6, Other ethnicity: 0.7), *trying to provide food even when the child is not hungry presented similar trends* (Greek: 0.7, Other ethnicity: 0.5).

Table 12:Correlation between child's BMI and selected independent indicators of physical activity

Independent indicators	***BMI (Greek ethnicity)[a]***		***BMI (Other ethnicity)[a]***	
	Correlation coefficient	***p value***	***Correlation coefficient***	***p value***
TV watching, daily (hours)	*0.77*	*0.03*	*0.71*	*0.04*
TV watching in weekends (hours)	*0.73*	*0.04*	*0.68*	*0.04*
Physical exercising or participating in music-dance games	*-0.78*	*0.03*	*-0.70*	*0.03*
Playing actively in kindergarten	*-0.78*	*0.01*	*-0.77*	*0.04*
Playing football in kindergarten yard	*-0.55*	*0.04*	*-0.69*	*0.03*
Playing basketball in kindergarten yard	*-0.76*	*0.02*	*-0.71*	*0.04*
Scheduled afterschool activities	*-0.78*	*0.01*	*-0.81*	*0.04*
*Physical activity**	*-0.97*	*0.04*	*-0.95*	*0.04*
Mother: Time watching TV or using computer during free time (per week)	*0.6*	*0.04*	*0.7*	*0.03*
Even when child is not hungry, parent tries to provide food	*0.7*	*0.03*	*0.5*	*0.04*

*variable computed based on frequency of TV watching, indoor and outdoor playing activities

[a] Pearson's correlation coefficient was performed

3.12. Risk of high body mass index based on physical activity indicators

Research Hypothesis

Some particular habits (such as TV watching daily and in weekends, mother's time spending in watching TV or using the computer and parent's feeding practices, like attempting to provide food even when the child is not hungry) would increase risk of high body mass index in preschoolers, regardless ethnicity.

Parents' nutritional and PA behavior over preschoolers would have a strong impact on child's BMI. We specifically hypothesized that maternal behavior towards child's feeding and nutritional habits could negatively or positively influence child's food intake, appetite arousal and food portion size.

Greek parents would have a more controlling attitude towards their children eating habits and behaviors, compared to immigrant parents.

Table 13 presents the joint effect of multiple PA indicators in increased risk for high BMI in preschoolers, testing for ethnicity. One independent predictor is also reported in the table; overall physical activity (β estimate= -0.8, p=0.02).

Other parameters that increase the risk of high BMI include *TV watching daily* (β estimate=0.6) *and in weekends* (β estimate=0.4), *mother's time spending in watching TV or using the computer* (β estimate=0.5) and *parent's attempting to provide food even when the child is not hungry* (β estimate=0.7).

Inversely, *vigorous PA* activities seemed to have a *protective role on BMI increases*. Such parameters are physical exercising in music-dance games (β estimate= -0.6), *active playing in kindergarten* (β estimate= -0.7) and *participation in additional scheduled afterschool activities* (β estimate= -0.6).

Table 13: Risk of high BMI in preschoolers based on physical activity indicators

Predictors	β estimate[a]	Standard Error	p value
Child's TV watching, daily (hours)	0.6	0.5	0.04
Child's TV watching in weekends (hours)	0.4	0.3	0.04
Physical exercising or participating in music-dance games	-0.6	0.3	0.02
Playing actively in kindergarten	-0.7	0.2	<0.001
Scheduled afterschool activities	-0.6	0.4	0.01
Physical activity*	-0.8	0.3	0.02
Mother: Time watching TV or using computer during free time(per week)	0.5	0.2	0.04
Even when child is not hungry, parent tries to provide food	0.7	0.1	0.03

[a] Linear regression model adjusted for ethnicity

*Independent predictor; Crude β estimate is provided

Chapter 4

Discussion

Discussion of the main findings

Physical activity, body mass index, and dietary habits are known to be important determinants of overall health status, but there is an evident lack of studies that examine these issues in preschool children[187], specifically in immigrant / ethnic minority preschoolers [8]. However, the lion's share of the research concerns childhood and adolescence, with scarcity of research evidence devoted to preschoolers, probably because of the estimation that preschoolers are usually more active and healthier[33].The current study, performed during the recent challenging period of the financial and refugee crisis in Greece, attempted to minimize the vacuum in the current knowledge on dietary and lifestyle patterns affecting health parameters in under 5 years old children of different ethnic background.

The main aim of this doctoral thesis was to investigate the individual and parental dietary and lifestyle factors associated with OW/OB among preschoolers in Athens, Greece, in other words, to identify existing associations between Body Mass Index, adhering to the Mediterranean diet (MD), KIDMED Score, levels of physical activity (PA), and body composition indices in Greek and immigrant preschoolers and their families, living in Athens, Greece.

The following lifestyle factors are found, according to the original results of our study, to affect health aspects of native Greek and ethnic minority preschoolers' in Attica, Greece.

Sociodemographic differences between native and non-indigenous preschoolers.

Gender and age of the participating families were almost similar between Greeks and those of other nationalities, in our study. Sociodemographic inequalities between native Greeks and preschoolers' families from other nationalities, however, were revealed regarding place of residence, educational level and profession. Deepening the results of our study, both population groups, indigenous (Greek) and other nationalities guardian parents, inevitably experienced unemployment, as a consequence of the Greek economic crisis, with immigrant parents, mainly

women, exhibiting significantly higher unemployment rates, fact that is interconnected to their place of residence, in the center of Athens, in less socioeconomically privileged areas, with more affordable cost of living.

Our study results echo similar findings about socio-demographic parameters playing an integral role in forming lifestyle and health behaviors[188], while immigrants are more vulnerable to social and economic disadvantage, usually having low income, poor housing conditions and higher unemployment rates than the native population of a country [189-191]. Similar sociodemographic ethnic differences were present in all covariates in the Generation R Study also assessing factors related to OB and OV in preschoolers in the Netherlands; non-Dutch mothers were lower educated, with lower household income, suffered more often from material hardship, compared to native Dutch mothers[4].

Focusing on the Greek multicultural reality, a recent study performed in Greece during the austerity period [192], revealed that a relatively small proportion (56.5%) of immigrant families - compared to the natives- had health insurance coverage due to their being unemployed, informally employed, even undocumented.

Guardian parent's obesity (BMI) and lifestyle factors (smoking status, alcohol consumption, physical activity) as determinants of preschoolers' dietary behavior and weight

A plethora of studies have indicated the direct connection of children's healthy way of living with family's adequate food consumption, physical activity, parents' limited alcohol intake and avoidance of smoking [193]. As prementioned above, low income has been, generally, associated with a tendency to unhealthy dietary habits, lower physical activity, alcohol consumption, heavier smoking and higher risk of chronic diseases [58,66,194].Furthermore, many studies have reported on the role of family's lifestyle and BMI on preschoolers' health behavior and overweight [190,195]. Due to the fact that the majority of guardian parents of our research sample were females (mothers), we assume that there is strong correlation among the degree mothers' age, dietary and lifestyle pattern determine children's BMI. Our study findings, stressing

guardian parents' age, obesity or overweight as well as smoking habits, alcohol consumption and physical inactivity, as clear indirect determinants of child's BMI and nutritional habits, come in compliance with relevant studies [66,195].

Parental obesity characteristics between the two groups in our study didn't vary, since mean BMI was almost similar (between limits of normal and overweight) in Greeks and guardian parents of other nationalities, result that disagree with the result of a similar study examining differences in OV&OB among young children from migrant and native origin[76], where BMIs of the mothers and fathers of Turkish and Moroccan children were significantly higher than those of the other parents.

Guardian parents' lifestyle variations were observed, with Greeks presenting significantly longer smoking activity (16.1 years) comparing to other nationalities (12.2 years). Additional variations were observed in physical activity, with the majority of other nationalities' parents being active (71.7%), while Greek parents being inactive (42.5%). Although there are some limited existing research data on Greek preschoolers' PA profile, according to which they fail to meet the recommendations of PA for that age [64,67,196], with immigrant preschoolers being in a more aggravated position [191], to the best of our knowledge, there is no existing research data on guardian parents', Greek and from other nationalities, PA levels.

Therefore, we consider our finding that immigrant guardian parents are more physically active than Greeks to be of major significance.

Significant association of parents' and preschoolers' dietary habits.

Considerable evidence supports the fundamental role parents play in shaping the development of child eating habits, behaviors [197] and their weight status [198]. The current study stressed this fact, by revealing significantly similar dietary habits between parents and preschoolers. Definitely, these findings presented trends based on a generalized pattern of their habits, concluding on the high impact of parental choices on children.

Compliance with the Mediterranean dietary habits (KIDMED score) and BMI between native and non-indigenous preschoolers.

Unhealthier and/or poorer diets according to the Mediterranean Diet Score [129] were associated in the literature with lower maternal educational level and parental unemployment [46]. Over the last years a decline in adherence to the Mediterranean dietary pattern has been observed [199], and a parallel gradual shifting away from traditional dietary habits towards more "Westernized" dietary choices, involving fast-foods, processed foods, sugary beverages and lower consumption of local traditional foods, as a result of cultural and economic progress. Such dietary pattern and preferences changes can be attributed to a higher availability of unhealthy foods due to the globalization of the markets [200,201], but can also be explained as an outcome of an economical issue, since healthier foods cost more than unhealthy and/or as an educational issue, as lower educated individuals may not have access to adequate information regarding health matters [202].

Similar trends were also reported in the current study, with ethnicity minority groups presenting slight divergence from the Mediterranean dietary pattern, yet with no negative impact on BMI. These minor variations could probably be a result of the overall impact of the financial crisis on the socio-economic status of all families regardless ethnicity [49]. The wider availability of foods and the improvement of living standards, along with the influence of the host country dietary habits, which are closer to the Mediterranean diet traditional pattern could often affect immigrants' living standards and dietary habits [58].

Towards this direction, non-indigenous families participating in our study presented satisfying levels of adherence to the Mediterranean diet, while they stated gaining weight upon permanent stay in Greece, mainly due to pregnancy or other reasons related to low physical activity, disease and anxiety. Our research finding that immigrant guardian parents' anxiety and stress was a risk factor for increased BMI, is in accordance with other studies[37], also showing that migration may be associated with a lack of social support in the new country, social isolation (due to language, cultural or administrative barriers) and sometimes experiences of marginalization or racism. These factors mean that some migrants are likely to experience some degree of stress. Stress has

been linked to obesity [203,204], for example through an association between stress and increased food intake, as well as potentially physiological effects of stress on metabolism [205,206].

Adherence to Mediterranean diet and BMI

According to a Greek study in 6-12 years old children [207] skipping breakfast, lack of fruits and vegetables consumption, and consumption of bread and soft drinks, were nutritional habits positively associated with obesity, while lower rates of obesity were attributed to children's healthy nutrition in school. Physical activity, at the same time, was inversely correlated with high BMI[207]. Some evidence in national studies from Mediterranean countries, such as Portugal, Spain, and Greece confirm a frequent intake of healthy food (e.g. fruit and vegetables) despite the high prevalence of OW/OB in early ages, attributed to extra energy intake from sugared beverages and snacks and higher than recommended protein intake, especially from dairy products[46].These observations seem to be slightly present in our study, particularly among the ethnic minority groups.

More specifically, ethnic minority groups in our study tended to consume fish more often than their native peers, but also consumed pasta or rice almost every day, they had commercially baked goods or pastries for breakfast and often skipped it. Breakfast skipping seems to be a growing scourge connected in the literature to an unhealthy dietary children's status leading to obesity risk and high BMI [208,209], depicted in higher percentages in immigrant children populations [191]. Although Greek preschoolers are also skipping breakfast [210], immigrant preschoolers -in our study- were significantly (twice the rate) more breakfast skippers comparing to their native peers. On the other hand, our study revealed that more native Greek preschoolers consumed olive oil at home and yoghurts and/or cheese daily, while they rarely visited restaurants/ fast foods and used less commercial goods that are higher than recommended in protein and sugar.

Familial characteristics and habits as predictors of high preschoolers' BMI

Low levels of parental physical activity*:* Studies examining the associations between PA and body fat in young children are scarce [73,211], and to the best of our knowledge, few studies have estimated the associations between objectively measured PA and BMI in preschoolers [99,212].

The association between parental physical activity and preschoolers‟ physical activity remains the most studied social factor in this age group. The positive association between parental and children's physical activity, meaning that preschool children are more likely to be physically active if their parents are physically active is the outcome of few studies in preschoolers [48,170]. It was found that parental physical activity had a significant influence on children‘s activity level. Thus, children of active parents may have six times greater chance of being active themselves than their peers whose parents are inactive [172]. In addition, parental encouragement and role modeling may support the child's physical activity through their influence on the child's self-efficacy [155].

Our study addressed, as well, the strong relationship between high levels of parental physical activity and children's active engagement in physical activities, with the positive, beneficial effect of their lower BMI, a pattern also observed in a preschooler's study in 2014[213]. Additional interesting findings about the interconnection of PA and BMI come from a study on the association between objectively measured PA and BMI in preschool children in Portugal [169]. Differences in levels of VPA were associated with weight status in 4-6 years-old children, suggesting that VPA influenced the change in BMI from those earlier ages. Those findings concur with other relevant studies showing the interconnection between low levels of VPA and body fatness during the adiposity rebound period [214].

Low parental frequency of following Mediterranean diet: Concerning the relationship of the MD with young children's BMI, although the relevant epidemiological studies are few and do not always show the same protective effect, it could be claimed [125] that higher parental adherence to the MD reduces the risk for children's OW/OB.

High frequency of watching TV while eating: The significant correlation between time spent on TV watching and BMI has been repeatedly shown since the eighties [215]suggesting that levels of children's TV viewing increase the overweight epidemic among children [1,59]. Socioeconomic inequalities in television viewing time, which may precede social disparities in overweight, have been observed in school-aged children [61,63-65] and adolescents [67,216] but there is significantly less knowledge about this association in preschoolers [11,55,72,188].

Our study results revealed that the habit of watching TV while eating constitutes a risk factor related to preschoolers' obesity status, which is in agreement with other research evidence about the significant correlation between time spent on sedentary leisure activities and risk for high BMI in young children [217].Similarly, according to the GENESIS study, examining the factors associated with television viewing time in Greek toddlers and preschoolers [218], children's BMI status, physical activity status, their maternal educational status and the region of residence were significantly associated with the time children spent in TV viewing. Another study in Australian preschool children analyzing the correlations between TV watching and BMI [219], indicated that only time spent viewing on weekdays was associated with child's BMI scores. Moreover, TV viewing is also positively linked with obesity risk through displacing PA and promoting frequent eating and consumption of takeaway foods while viewing, but negatively associated with daily vegetable intake [219].

Mother's age and child's BMI**:** Our study evidenced that mother's age and BMI significantly increase the risk of high BMI in preschoolers, which is consistent with previous studies in preschoolers, also revealing a higher prevalence of OW/OB in children with overweight/obese parents compared to their peers' parents with normal weight [10,220,221]. A child's BMI was more strongly associated with mother's BMI than father's BMI [222,223]. Similarly, according to the GRECO Study [188] and the Toybox Study [224]in preschoolers, mother's age was a protective predictor for both girls' and boys' OW/OB status, while parents' obesity status had a positive effect on the likelihood of being an OW/OB child. According to a Greek study recording OW/OB prevalence in preschoolers [10], kids with one obese parent had 91% greater odds for being

overweight compared to those with no obese parent, while the likelihood for being overweight was grander for young children with two obese parents.

***Parental smoking and alcohol consumption*:** Our study depicted the increased risk for high BMI in preschoolers whose parents are long-term smokers and alcohol consumers. In line with previous research, higher maternal alcohol consumption during pregnancy is associated with a slightly lower likelihood of 14-month-old infants following a 'health conscious' dietary pattern [185]. Maternal smoking during pregnancy or early infancy and paternal smoking during the prenatal period are predominantly associated with infants or children up to age 7 years following unhealthier diets and/or being less likely to adhere to healthier diets.

***Eating out in fast food restaurants*:** In our westernized world fast food consumption figures as a major source of health problems associated with obesity. Eating outside home has been associated with higher intake of dietary fat and energy compared to home eating, and as frequency of eating at fast-food restaurants has increased, consumption of fruit, vegetables, and dairy has decreased [225]. Our research study, also pointed out that the risk of obesity and high BMI score in children is elevated the more often they eat outside home, in fast food restaurants.

Familial characteristics and habits decreasing risk of high BMI in preschoolers.

***Breakfast consumption as determinant of young children's BMI*:** Promoting breakfast eating among children is multibeneficial, including improved cognitive and physical abilities, increased likelihood of meeting the recommendations for fruit and vegetable intake, and decreased unhealthy snacking [99]. Our finding echoes that of the Greek PANACEA Study in 10-12-year-old Greek children [226], in which daily consumption of breakfast was also inversely associated with prevalence of OW/OB in both genders [227]. Moreover, 4-5 year-old children who were not eating breakfast every day were twice as likely to become overweight or obese [228].In a study performed in 2-5 year-old children in Australia [229], skipping breakfast was associated with higher BMI in

children and mothers. Skipping breakfast was positively associated with 2-3-year-old boys whose mothers were overweight and with 4-5-year-old girls whose mothers were obese.

***Brunch and early dinner and their relation to preschoolers' BMI*:** Parental and familial dynamics strongly influence the incidence and regularity of family meals having a protective effect in young children's BMI [108]. Regular family meals are related with a lower risk of OW/OB, higher average of fruit and vegetable intake, lower fast food and soft drink consumption and an overall better diet quality [230]. Our research demonstrated that brunch consumption and the latest time of dinner consumption is inversely associated with high BMI and occurrence of OW/OB in preschoolers, regardless of gender and ethnic background. According to relevant literature review findings [230], significant associations between higher family meal frequency and better overall diet quality, less unhealthy diet and lower BMI were revealed. Child's age, country, number of family members present at meals and meal type (i.e. breakfast, lunch or dinner) did not moderate the relationship of meal frequency with healthy diet, unhealthy diet or BMI. The protective effect of family meal frequency against child OW/OB, was also the research finding of a study performed in recent immigrant mothers and their children aged 3-12 years in USA [231].

***Consumption of vegetables and fruits and its impact on BMI levels*:** Fruit and vegetable intake has been reported [132] to be below the recommended guidelines in younger children and adolescents. Our research depicted the positive association between family's frequent consumption of vegetables and fruits and lower BMI in preschool children. Some studies on the relationship between parenting styles and fruit and vegetable intake in young children indicate no differences in fruit and vegetable consumption among children across parenting styles [232], while others link children's higher intake of fruits and vegetables and a generally less risk of child overweight to authoritative style mothers [233] and non-authoritative [233] or permissive fathers [234]. Informing the child about the nutrition benefits of fruits and vegetables at home-have been consistently associated with preschoolers' consumption of healthier foods [235], suggesting parental protection strategy against excessive weight gain.

***Parental control of preschoolers' diet as determinant of BMI*:** To the best of our knowledge, there are no previous research data on this topic performed in native or immigrant preschoolers in Greece. With regard to directionality of influence between parental feeding and preschoolers' BMI, limited longitudinal studies exist on controlling feeding practices [15]. Associations between parental structural strategies and lower BMI score have been also reported [236], suggesting that parental structural strategies aiming at promotion of healthy eating are more adopted at preschool age, while they seem to be of less value at older child ages probably due to the degree of child's independence. Existing literature with low-income minority samples suggests that certain parental feeding practices, such as an indulgent feeding style, were associated with child overweight [237]. A cross-sectional study of ethnically diverse, low-income preschoolers and their mothers [238] exhibited that neither child race nor maternal pressure to eat and restriction were linked to child overweight based on child BMI. Nevertheless, ethnic differences in parental feeding styles have been found, with Hispanic parents reporting more indulgent and African-American parents reporting more uninvolved feeding practices than other ethnic groups [237].

Predictors of positive preschoolers' KIDMED score

Parental and children's frequency of following the Mediterranean diet are depicted, in our study, as positive predictors of preschoolers' higher KIDMED score. As it was, similarly, shown in the Greek Childhood Obesity (GRECO) study, children with higher KIDMED score presented more frequent consumption of foods sustaining the MD pattern (fruits, vegetables, legumes, dairy products, fish, bread, nuts) and a less frequent consumption of foods that undermine the MD scheme, and should be consumed in moderation or rarely [148]. Moreover, breakfast consumption, the habit of having family meals during the week, and higher adherence of parents to the MD increased the odds of a child presenting higher KIDMED score [148]. The adverse association between low adherence to the MD dietary patterns and a non-optimal KIDMED score was similarly addressed in another study of Greek children [143,239], as well as Cypriot children [240].

Along with a better-quality diet, ***child's increased physical activity***, constitutes another positive predictor of their higher KIDMED score, finding which is in agreement with the GRECO study [148], where children with a higher KIDMED score reported having higher levels of physical activity and a healthier lifestyle.

Predictors negatively associated with preschoolers' KIDMED score

Watching TV while eating, according to our study, constitutes a risk factor increased for native as well as immigrant young children's KIDMED score, finding which is supported in similar studies, where the habit of watching TV while eating increased consumption of high-fat and high-sugar foods and reduced intake of fruits and vegetables, resulting in increased energy intake and lower KIDMED score [241].

Additionally, according to our study, parents with high BMI and long-term smoking parents aggravate the outcome of higher KIDMED score.

PA and BMI variations between preschoolers of different ethnicities: almost similar BMI level, variations in TV viewing, and participation in PA activities and sports during school time and afterwards

BMI was found to be almost similar between Greek preschoolers and their peers of other ethnicity (normal/healthy weight) in our study, whereas, contrary to our findings, another study investigating sociodemographic, ethnic and dietary factors associated with the development of childhood obesity in children, aged 8-12 years in Thessaloniki, Greece[8], revealed significantly lower rates of OW/OB in immigrant children (10% and 3.3%, respectively) compared to Greek children, with no difference found in the prevalence of obesity between children from urban and rural areas. Variations in the mean BMI scores between native and immigrant children, were also the finding in another study [76], where Dutch children had the lowest BMI score, while all children from migrant descent had higher BMI, especially Turkish children. Also, among migrant groups the prevalence of overweight, including obesity, were highest. Turkish and

Moroccan children show the lowest prevalence of underweight, as compared to the other groups of children [76].

Our doctoral thesis revealed significant variations in PA items connected with BIM, as preschoolers of other ethnicities, comparing to their native Greek peers, tended to watch TV more hours daily, as well as during the weekends. In accordance with our findings, other few studies revealed that adverse sedentary lifestyle behaviors linked with obesity risk such as excessive amounts of TV watching, have been shown to be more common among preschoolers from low family socioeconomic status or of ethnic minority groups [59,176,180]. In light of the many adverse health effects associated with children's television viewing[173,219], the findings of our study indicate a strong need for preventive measures at a young age and provide information on intermediary factors that may be targeted in prevention programs aimed to reduce educational disparities in television viewing.

Another significant variation revealed in our study between native and immigrant preschoolers, concerning obesity and PA habits had to do with children's participation in vigorous PA activities (free and organized) during the school program, as well as afterschool PA activities (free, like walking with their parents and organized, like organized team sports).

Since preschool children spend a considerable amount of time at school, these settings provide an opportunity to increase preschoolers' energy balance-related behaviors, resulting in preschool-based interventions [73,242-244]. During the time at kindergarten, several opportunities arise in which preschoolers' energy balance-related behaviors can be improved, for example during recess at the playground in which preschoolers can increase their physical activity levels [245,246], during structured physical education lessons [243], or by making changes to the preschool curriculum and environment, or the preschool policy [242,247]. Nevertheless, there is a noticeable gap of research evidence on preschoolers' participation in school PA activities and an even bigger gap of research evidence on native Greek and immigrant preschoolers in Greece. For this reason we consider our research findings to be of top significance.

In our study *duration of playing basketball in the kindergarten's yard* was found to vary significantly in favor of preschool children of other ethnicity. Similarly, they *played* more *both in*

actively and sedentary position in the kindergarten comparing to their Greeks peers. The majority of Greek preschoolers, on the other hand, in our study, tend to *play in the playgrounds* and have several *scheduled afternoon activities*. Furthermore, native Greek preschoolers seemed to have *more intense PA during summer* as well, as well as frequent *skating*. Still Greek children reported that they went for *calm or intense walk with their parents,* less frequently, *a habit that found to be significantly higher in preschoolers of* other ethnicity.

Similarly to our study, sports and vigorous PA were significantly more frequent in native Italian girls (preschoolers) than in immigrant girls[36].Other studies have also demonstrated that native-born children have greater participation in sports and afterschool PA compared to immigrants [76,176,180].

A potential explanation is discussed in the literature, and is related to language as one of the existing barriers [21]. Problems immigrants are facing having to do with speaking the language of the host country seem to have an impact on PA in several ways, including difficulties in accessing knowledge/literacy about PA, health assets, as well as information on when and where to access PA in the host country [21].

Cultural background, host country's attitudes towards immigrants from a specific country, financial limitations, racial harassment and lack of knowledge of host culture could also play a core role on these differences [21,248-253]. This could also be explained under the light of the Greek austerity period and the additional financial barriers that immigrants have compared to the native population [254]. It is widely met that immigrant families can't afford systematic after school activities, which most of the times are costly, and therefore preschoolers are mainly activated during school hours and/or in free of charge sedentary behavior at home [184,248,251].

PA indicators as risk and protective factors for preschoolers' BMI

Several correlations were identified between child's BMI and selected PA and behavioral indicators, in Greek and other ethnicity groups. Overall, *PA was inversely correlated to BMI* (i.e. the less they exercise the more increased BMI). *Strongest inversely proportional associations (protective role on BMI increases) were noticed in*: physical exercise/participation in music-

dance games, playing actively in kindergarten and young children's *participation* in scheduled afterschool activities.

A wide range of studies has stressed already established PA related risk factors for increased BMI, but mainly focuses on children of other age groups (rather than preschoolers) [255,256]. However, there is some evidence supporting current findings on preschoolers. Preschoolers TV watching, mother's and parental TV watching and sedentary behavior, as well as their nutritional behavior over their children are the major risk factors under discussion [257-259].

Concerning the impact of parental feeding practices on children's BMI, our study revealed that parent's attempting to provide food even when the child is not hungry is another risk factor for increased BMI in preschoolers, regardless ethnicity. In alignment with our finding, other studies, also performed in preschoolers, revealed than parents' nutritional and PA behavior over preschoolers (e.g. feeding them even when they are not hungry and PA choices, etc) may have a strong impact on child's BMI [89,260]. Such parental attitudes are important, since studies suggest that maternal behavior towards child's feeding and nutritional habits could negatively or positively influence child's food intake, appetite arousal and food portion size [261]. At the same time, evidence explains that components of appetite reactivity have significant effect on child's adiposity which is partly mediated by child's actual food portion size and later affects BMI trends as child gets older[261].

"Investing" in the maximizing children's participation in PA activities is multiply beneficial with consequent protective effects, not only for the prevention of obesity, but also in other aspects of children's health, such as bone and skeletal health, cardiometabolic health, motor skill development, cognitive development and psychosocial health[32,33]. On this premise, the need for the integration of movement programs that nurture children's both actual and self-perceived skills within preschool education is warranted.

Study strengths and limitations

While research has investigated the relationships among food-related parenting practices and children's diet in school-age children and adolescents, there are only few relevant studies focusing on preschool children from culturally diverse samples. There is a noticeable gap of knowledge from previous research concerning the health impact of parental role of healthy eating and lifestyle behaviors on the dietary patterns in preschool children of different ethnic background.

To the best of our knowledge, this was the first study on dietary and lifestyle habits of preschoolers of different ethnicity residing in Attica, the largest administrative region in Greece. At the same time, it measured the same outcomes in both preschoolers and their guardian parent, attempting to comprehend the impact of familial habits on child's BMI. The design and the selected already validated instruments used, were among the major strengths empowering study's findings. Furthermore, the continuous monitoring of the survey processes and the satisfying geographical coverage of the kindergartens have added value to our key findings that comply with most studies in the literature as well as with our observations and experience in the Greek setting.

Our study findings are the first to report on this particular topic in a Greek setting that could be representative of the wide socio-demographic variation of Greek residents. At the same time, inclusion of indigenous families and preschoolers enriched study's design, power, timeliness and impact. Furthermore, the fact that validated tools were used and a wide range of parameters were measured, supported our approach towards revealing predictors of increased BMI and low KIDMED score within the prism of multivariate analysis.

However, results should be discussed under the light of several *limitations* and be carefully translated into further research and actions, including the un-clustered sampling and the small number of participants per non-indigenous ethnicity group. For instance, families from Albania were much more numerous than those from other countries, such as Sudan and Syria, constituting any cross-correlations impossible. Power analysis was not conducted since we addressed all active kindergartens and managed to have satisfying response rates. Potential

limitations due to this fact could lead to underestimation of preschoolers BMI and should be taken into consideration. Nevertheless, we believe that underestimations of the outcomes are limited and may not affect final conclusions. Due to the final number of participants, good geographical coverage of kindergartens and inclusion of families of different socio-demographic and ethnicity background support our core findings. Additionally, no clinical and somatometric measurements were performed, since all data were self-reported; potentially hiding slight information or/and recall bias. Lastly, significant findings were discussed in this paper, nevertheless no casual associations exist between the observed trends due to the nature of this cross-sectional study.

Chapter 5

Conclusions &

Implications of the study

CONCLUSIONS

Obesity is one of the most serious risks in the developed world for children's health leading the researchers towards the unearthing of the main causes in the core of this epidemic phenomenon and the seeking of the best health practices for its elimination. Our study highlighted that adherence to a healthy parental dietary choices and lifestyle is strongly associated with a substantially reduced risk of OW/OB in preschoolers, regardless of ethnicity.

The novelty of the present study is that risk factors for overweight/obesity, lifestyle, dietary, and sociodemographic factors that often cosegregate and whose causative role has been firmly demonstrated in older children and adolescents have been investigated at the same time in preschoolers.

The present findings, offering further insight into the understanding of those family and individual characteristics associated with more 'healthy' or 'obesogenic' dietary intake habits and lifestyles in both native and immigrants preschoolers in Greece, could represent a stepping stone for the formulation of nominal early life obesity curbing family, as well as school-based interventions and public health policies.

In this study, the social environment, especially parental role modeling, contributed clearly to differences in physical activity and dietary intake. Our research findings highlight the potential benefits of implementing family based multifactorial interventions to curb the risk of high BMI in children leading to childhood obesity. Parents, as nutritional gatekeepers, influence and shape, especially in the early years, their child's eating behavior both directly, through the food they prepare and consuming at home, and indirectly, through their behavior, attitudes and the nutritional environments they choose for their children inside, or outside home.

Significant comparative new research data on the sociodemographic, dietary and lifestyle profile Greek and immigrant parents' were derived from our doctoral study: Contrary to our research hypothesis, guardian parent's obesity characteristics didn't vary, since mean BMI was almost similar in Greeks and other nationalities, between limits of normal and overweight.

Other nationalities, however, gained weight upon stay in Greece, mainly due to pregnancy or other reasons related to low physical activity, disease and anxiety. Place of residence, educational level and profession varied significantly, as it was hypothesized, between Greek and other nationalities, bringing to the forefront socioeconomic barriers due to migration, but also due to the austerity period in Greece. Additional variations were observed *in the* levels of smoking status, alcohol consumption, levels of physical activity between the guardian parents, according to nationality, confirming our research hypothesis that there would be variations in lifestyle habits between Greek parents' and other ethnicity guardian parents'. Measuring ***parental smoking activity***, approximately 35% of both participating groups were smokers, with *Greeks* presenting significantly *longer smoking activity* comparing to other nationalities. Furthermore, level of ***alcohol consumption*** varies between the guardian parents with more Greek parents consuming alcohol than parents of other nationalities. Additional variations were observed in parental ***physical activity***, with *the majority of other nationalities' parents being active*, while *Greek parents being inactive*. *We* consider our comparative findings regarding parental smoking activity, alcohol consumption and levels of physical activity between Greek and immigrant guardian parents to be of major significance, because to the best of our knowledge, there is no relative existing research data on guardian parents', Greek and from other nationalities.

The present doctoral thesis, also achieved the initial aim, to investigate the ***parental dietary and lifestyle habits acting as risk factors of children's increased KIDMED Score*.** Our study highlighted that parents with high BMI, as well as long-term smoking negatively affect the outcome of higher KIDMED score. Moreover, the habit of TV viewing while eating, according to our study, constitutes a risk factor negatively affecting young children's (native as well as immigrant) KIDMED score, as it results in increased consumption of high-fat and high-sugar foods and reduced intake of fruits and vegetables, in other words, in increased energy intake and lower KIDMED score.

Parental dietary and lifestyle habits that synergistically act as risk factors of children's increased BMI, were also assessed, according to the objective of the present study. Strong correlations were depicted between child's BMI and several individual or family indicators, such

as Guardian parent's age and BMI are positively correlated with child's BMI, as well as guardian parent's lifestyle(physical inactivity, smoking and alcohol consumption),parents' low frequency of following the Mediterranean nutritional scheme, dinner consumption latest the time, consumption of meals at fast food restaurants, mother's time spending in watching TV or using the computer, parent's attempting to provide food even when the child is not hungry, seem to be clear indirect determinants of child's BMI with negative impact on child's weight and overall health. On the contrary, ***parental dietary and lifestyle aspects as protective factors of preschoolers' BMI*** consumption of breakfast and brunch, high frequency of consuming vegetables or fruits, parental control on child's diet and physically active parents seemed to diminish the risk for high BMI in children.

Although Greek and immigrant children's BMI didn't vary, taking into serious consideration the fact that, be KIDMED score was "poor" in the majority of children in both groups (Greeks and other nationalities), parents should be aware of their role in shaping the home environment and, therefore, should be informed and targeted to focus on interventions, aiming at stimulating healthy food choices and dietary habits in their children. In particular, as breakfast skipping, was found, to be a common dietary habit between Greek and other ethnicities preschoolers, that increases risk of high BMI, parents should reinforce the beneficial habit of a rich breakfast both at home and during school time, eliminating commercially baked goods or pastries for breakfast, which constitutes an unhealthy choice, as shown in our study.

Significant comparative new research data on the physical activity profile of Greek and immigrant preschoolers' and guardian parents' role in enhancing and encouraging children's participation were derived from our doctoral study: children's engagement in physical exercising in music-dance games, active playing in kindergarten, along with participation in additional scheduled afterschool activities were found in our study to be PA parameters that decrease the risk of high BMI in young children. *Almost similar BMI was found between Greek preschoolers and their peers of other ethnicity*, many PA items, however, varied significantly. Preschoolers of other ethnicity, comparing to Greeks, tended to watch TV more hours daily and during the weekends. Nevertheless, immigrant preschoolers played more both in actively and sedentary position in the kindergarten during the scheduled and free activities and participated

more in basketball playing in the kindergarten's yard. The majority of Greek preschoolers, on the other hand, tend to *play more in the playgrounds* and participate in several *scheduled afternoon* sports activities (swimming, basket, gymnastic, dance). Greek preschoolers also seemed to have *more intense PA during summer,* and play at the sand. Still they reported less frequently that they went for *calm or intense walk with their parents*.

Despite the acknowledged fact that physical activity is a healthy behavior that all children should incorporate in their everyday life by linking it with the idea of pleasure and well-being, both in school and at home, according to our study results, guardian parents don't seem to act as facilitators of their children's physical activity; the vast majority of guardian parents –with a slightly lower proportion in immigrant parents-reported that spent almost no *personal time to facilitate child's physical activity*. Since in the short term, physical activity has a greater impact in prevention than in the correction of childhood obesity, parents, despite the barriers of insufficient time, income, should be motivated to promote an active lifestyle in favor of their children.

Key messages and implications of the study

- The current study conveyed new knowledge on BMI prevalence in preschoolers and their families, controlling for the role of ethnicity and other behavioral and lifestyle factors of both groups (children and guardian parent), during the Greek financial crisis.
- Our study addressed, as well, the strong relationship between high levels of parental physical activity and children's active engagement in physical activities, with the positive, beneficial effect of their lower BMI
- It was evident that although BMI was almost identical between the ethnicity groups, several variations in the lifestyle, dietary and physical activity patterns were observed and could strongly affect their later life in adolescence and adulthood.
- Implementation of school-based and family-based, as well as community-based nutritional, as well as physical activity enriching programs targeting on parents and children better health outcomes are of extreme importance and priority.

- Education and familial socioeconomic status could be considered core indicators associated with healthier quality diets and should be the main target in future interventions towards a healthier lifestyle.
- Therefore, future studies should focus on the exact nutritional habits of parents and children in home and school, explicit physical activities, lifestyle beliefs and attitudes as well as cultural and spiritual beliefs.
- Socio-economic characteristics jointly with food intake and physical activity patterns have to be considered within the spectrum of individual and family particularities and special needs.
- Policy makers, parents and teachers should all be aware that 'cost' and 'time' are key barriers to parents' and children's participation in sport. More local sports opportunities are needed where costs are reduced. Schools and local sports clubs could better work together to provide more affordable local opportunities to increase children's participation in sport.
- Raising awareness among parents, especially the lower educated, of the harmful effects of placing television sets in children's bedrooms and of the effects of their own lifestyle behaviors, television viewing in particular, may be a fruitful approach to reduce the educational gradient in television viewing time among preschool children. Further research into additional mechanisms that underlie the association of family SEP with children's television time is warranted. Insight into these underlying mechanisms is crucial for the development of effective interventions designed to reduce the socioeconomic gradient in children's television viewing and ultimately children's health.
- An important public health message should be the idea of PA and health living "investment". The observed burden, associations and identified risk factors could support additional research hypothesis generation, as well as first-level intervention programs in Greece and other countries of similar socio-demographic profile.
- "Investing" in the maximizing children's participation in PA activities is multiply beneficial with consequent protective effects, not only for the prevention of obesity, but also in other aspects of children's health, such as bone and skeletal health,

cardiometabolic health, motor skill development, cognitive development and psychosocial health [32,33]. On this premise, the need for the integration of movement programs that nurture children's both actual and self-perceived skills within preschool education is warranted regardless ethnicity [76].

- Furthermore, this study should become the cornerstone for policy makers in Greece, to enhance sport activities and free access PA programs for preschoolers. Systematic monitoring of these programs in time would be essential for the promotion of healthy behaviors of immigrants, minority groups and the entire Greek population. Following the NASPE guidelines [161], PA interventions in preschoolers should be coordinated and implemented nationally. International evidence recommends family's daily engagement to PA should exceed the 120 minutes of PA and avoid staying inactive for more than 60 minutes at a time (except while sleeping) [161].
- Reducing financial barriers to activities, especially for children, could be a beneficial consequence of improving sports participation for low socio-economic groups.

Suggestions for further research

Given the current difficult era of huge waves of refugee population entering Greece, social inequalities and cultural differences is a public health research priority area. Moreover, taking into serious account that the evidence base for effective obesity prevention programs in preschool-aged children is still emerging, more information is required to better inform prevention program development for preschool children for native and immigrant preschoolers as well. A future extension of this research study, including gender issues concerning preschoolers' dietary and lifestyle habits, as well as educators' point of view on dietary and PA habits of Greek and other ethnicity preschoolers' is seriously considered.

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LIST OF APPENDICES

APPENDIX 1

RESEARCH APPROVAL FROM THE GREEK MINISTRY OF EDUCATION

ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
ΥΠΟΥΡΓΕΙΟ ΠΑΙΔΕΙΑΣ,
ΕΡΕΥΝΑΣ ΚΑΙ ΘΡΗΣΚΕΥΜΑΤΩΝ

ΓΕΝΙΚΗ Δ/ΝΣΗ ΣΠΟΥΔΩΝ Π/ΘΜΙΑΣ ΚΑΙ Δ/ΘΜΙΑΣ ΕΚΠΑΙΔΕΥΣΗΣ
ΔΙΕΥΘΥΝΣΗ ΣΠΟΥΔΩΝ, ΠΡΟΓΡΑΜΜΑΤΩΝ & ΟΡΓΑΝΩΣΗΣ Π.Ε.
ΤΜΗΜΑ Α' ΣΠΟΥΔΩΝ
& ΕΦΑΡΜΟΓΗΣ ΠΡΟΓΡΑΜΜΑΤΩΝ

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Να διατηρηθεί μέχρι:
Βαθμός Προτεραιότητας

Μαρούσι, 28-12-2016

Αρ. Πρωτοκόλλου :Φ15/1774/222145/Δ1

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2. Διευθυντές Εκπ/σης Π.Ε. Α΄ Αθήνας,
Β΄ Αθήνας, Γ΄ Αθήνας, Δ΄ Αθήνας,
Ανατ. Αττικής & Δυτ. Αττικής.
3. Αρμόδιους Σχολικούς Συμβούλους
Προσχολικής Αγωγής (Μέσω των αντίστοιχων
Δ/νσεων Π.Ε)

ΘΕΜΑ : Επέκταση έρευνας

Σχετικά έγγραφα: το σχετικό 205754/Δ1/2-12-2016

Απαντώντας σε αίτημά σας για χρονική επέκταση εγκεκριμένης έρευνας με θέμα «*Συγκριτική μελέτη παραγόντων τρόπου ζωής που επηρεάζουν τον τομέα της υγείας παιδιών προσχολικής ηλικίας γηγενών Ελλήνων και οικονομικών μεταναστών στη χώρα μας*», σας κάνουμε γνωστό ότι σύμφωνα με την με αριθμ.46/24-11-2016 πράξη του Δ.Σ. του Ι.Ε.Π. εγκρίνεται η διεξαγωγή της εν λόγω έρευνας και κατά το σχολικό έτος 2016-2017 καθώς και η επέκτασή της στα σχολεία του συνημμένου πίνακα.

Επισημαίνεται ότι η έρευνα θα διεξαχθεί σύμφωνα με τις προϋποθέσεις που αναφέρονται στο με αριθμ. Φ15/465/88233/Γ1/1-7-2013 έγγραφο, που αφορά στην αρχική έγκρισή της από το Υπουργείο Παιδείας, Έρευνας & Θρησκευμάτων.

Οι Διευθυντές Πρωτοβάθμιας Εκπαίδευσης στους οποίους κοινοποιείται το έγγραφο αυτό, παρακαλούνται να ενημερώσουν σχετικά τα σχολεία στα οποία θα διεξαχθεί η έρευνα.

Συν.: 5 φύλλα

Εσωτερική Διανομή:
Δ/νση Σπουδών, Προγραμμάτων
& Οργάνωσης Π.Ε.
Τμήμα Α'

Ο ΓΕΝΙΚΟΣ ΓΡΑΜΜΑΤΕΑΣ

ΙΩΑΝΝΗΣ Δ. ΠΑΝΤΗΣ

APPENDIX 2

GUARDIAN PARENT INFORMATION AND CONSENT FORM

ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ

ΤΟΜΕΑΣ ΚΟΙΝΩΝΙΚΗΣ ΙΑΤΡΙΚΗΣ

Θέμα: «Συμμετοχή Νηπιαγωγείων σε ερευνητικό πρωτόκολλο διδακτορικής διατριβής. Έντυπο ενυπόγραφης συγκατάθεσης γονέων».

Αγαπητοί Γονείς,

Ονομάζομαι ***Μαρία Χρυσίνη του Κωνσταντίνου***, είμαι Νηπιαγωγός (4ο Νηπιαγωγείο Βριλησσίων) και υποψήφια διδάκτορας του Τμήματος Ιατρικής του Πανεπιστημίου Κρήτης. Στα πλαίσια εκπόνησης της διδακτορικής μου διατριβής πρόκειται να μελετήσω παράγοντες που επηρεάζουν τον τομέα της υγείας των παιδιών προσχολικής ηλικίας, Ελλήνων και οικονομικών μεταναστών στη χώρα μας, όπως: οι διατροφικές συνήθειες και επιλογές γονέων και παιδιών, ο ρόλος της τηλεόρασης στη διαμόρφωση των συνηθειών αυτών, η φυσική κατάσταση γονέων και νηπίων καθώς και η παθητική έκθεση στο κάπνισμα, σε παιδιά προσχολικής ηλικίας (5-6 ετών) που φοιτούν σε *Ολοήμερα Τμήματα διευρυμένου ωραρίου*, δηλαδή έως τις 4.00 μ.μ.

Στην Ελλάδα, η έρευνα στο χώρο της προσχολικής αγωγής και η ερευνητική μελέτη σχετικά με θέματα διατροφής, άσκησης και ανάπτυξης -θα λέγαμε- μιας υγειούς διατροφικής κουλτούρας και άσκησης είναι περιορισμένη. Λαμβάνοντας, επίσης, υπόψιν ότι τόσο οι γονείς, όσο και οι εκπαιδευτικοί αποτελούν ισχυρά πρότυπα αντιγραφής, μίμησης και διαμόρφωσης μιας υγιεινής ή μη συμπεριφοράς (role modeling) στα παιδιά της ηλικιακής αυτής ομάδας, η πραγματοποίηση της συγκεκριμένης έρευνας θεωρείται σημαντική, καθώς, μέσα από την ερευνητική προσέγγιση του δίπτυχου σχολείο - οικογένεια (γονείς, παιδιά, Νηπιαγωγοί), θα συμβάλλει στη συλλογή και επεξεργασία νέων πληροφοριών, στην εξαγωγή νέων συμπερασμάτων για τη διατροφική συμπεριφορά, τη φυσική κατάσταση των νηπίων και τη γενικότερη κατάσταση υγείας, παιδιών προσχολικής ηλικίας, ελλήνων και μη.

Η συμπλήρωση του ερωτηματολογίου είναι *προαιρετική*, ως εκ τούτου οι συμμετέχοντες έχουν το δικαίωμα να αρνηθούν τη συμμετοχή τους στην έρευνα ή και να αποσυρθούν από αυτή σε οποιοδήποτε στάδιο της.

Ωστόσο, προκειμένου να επιτευχθεί ο σκοπός της έρευνας και να υλοποιηθεί επιτυχώς η εξαγωγή των ερευνητικών αποτελεσμάτων και συμπερασμάτων, παρακαλείσθε θερμά να συμπληρώσετε τα παρακάτω δυο (2) ερωτηματολόγια:

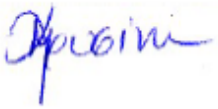
1) το **«Ερωτηματολόγιο Συχνότητας Κατανάλωσης Τροφίμων και Ποτών»**, το οποίο περιλαμβάνει ερωτήσεις: α) Συχνότητας Κατανάλωσης Τροφίμων και Ποτών που καταναλώνονται συνήθως από τα παιδιά στο σπίτι και στο σχολείο και β) Ερωτήσεις για τις διατροφικές συνήθειες πριν το σχολείο (πρωινό γεύμα στο σπίτι) και κατά τη διάρκεια του σχολικού ωραρίου.
2) Το Ερωτηματολόγιο Αξιολόγησης της Φυσικής Κατάστασης των νηπίων.

Η έρευνα θα πραγματοποιηθεί ακολουθώντας τους κανόνες Ηθικής και Δεοντολογίας (διασφάλιση προσωπικών δεδομένων συμμετεχόντων, κλπ) σύμφωνα με τις διεθνείς πρακτικές. Για το λόγο αυτό ***δεν*** χρειάζεται να αναγράψετε προσωπικά στοιχεία (ονοματεπώνυμο, διεύθυνση και τηλέφωνο σχολείου) στο ερωτηματολόγιο.

Σε περίπτωση που χρειάζεστε κάποια διευκρίνηση, παρακαλώ μη διστάσετε να επικοινωνήσετε με τις εκπαιδευτικούς του σχολείου.

Σας ευχαριστώ εκ των προτέρων για τη συνεργασία,

Με εκτίμηση



Χρυσίνη Μαρία
Νηπιαγωγός
Υποψήφια Διδάκτωρ Πανεπιστημίου Κρήτης

ΥΠΟΓΡΑΦΗ ΣΥΜΜΕΤΕΧΟΝΤΑ ΣΤΗΝ ΕΡΕΥΝΑ ΓΟΝΕΑ

ΥΠΟΓΡΑΦΗ: .....

ΗΜΕΡΟΜΗΝΙΑ ... /..../.....

APPENDIX 3: 'Rhea follow-up FFQ'

Α.2. ΕΡΩΤΗΜΑΤΟΛΟΓΙΟ ΠΡΟΣ ΓΟΝΕΙΣ

Α. ΕΝΟΤΗΤΑ
Α1. Γενικά χαρακτηριστικά γονέων

1. Φύλο ερωτόμενου (κηδεμόνα)
   μητέρα ☐ πατέρας ☐ γιαγιά ☐ παππούς ☐ άλλο ☐
2. Ηλικία (έτη) του πατέρα: ..... και της μητέρας: .....
3. Χώρα προέλευσης .....
4. Τόπος διαμονής .....
5. Χρόνια παραμονής στην Ελλάδα .....
6. Βάρος ερωτώμενου (kg) .....
7. Ύψος ερωτώμενου (cm) .....
8. α. Από τότε που ήρθατε στην Ελλάδα πήρατε βάρος; Ναι ☐ Όχι ☐
   β. Αν ναι, πόσο βάρος (Kg) πήρατε; .....
   γ. Για ποιο λόγο, πιστεύετε, πως πήρατε βάρος;
   .....
   .....
   .....
   .....
   .....
   .....
   .....
9. Ποιο είναι το μορφωτικό σας επίπεδο; (Κυκλώστε 1 αριθμό από το 1-11):
   Πατέρας ☐ Μητέρα ☐

   1. Δεν πήγα σχολείο
   2. Δημοτικό σχολείο χωρίς να το ολοκληρώσω, αλλά μπορώ να διαβάσω και να γράψω
   3. Τελείωσα το δημοτικό σχολείο
   4. Ολοκλήρωσα την _____τάξη του Γυμνασίου
   5. Τελείωσα γυμνάσιο
   6. Ολοκλήρωσα την _____τάξη του Λυκείου
   7. Τελείωσα λύκειο
   8. Φοίτησα _____ χρόνια σε ανώτερη σχολή
   9. Φοίτησα _____χρόνια σε πανεπιστημιακή σχολή
   10. Τελείωσα το πανεπιστήμιο (ΑΕΙ/ ΤΕΙ)
   11. Δεν ξέρω/ Δεν απαντώ

10. Επάγγελμα πατέρα: .....
    Επάγγελμα μητέρας: .....
11. α. Καπνίζετε; Ναι ☐ Όχι ☐

1

β. Εαν ναι, πόσα τσιγάρα καπνίζετε;

Λιγότερο από 10 τσιγάρα την ημέρα ☐
Μισό πακέτο την ημέρα ☐
Έως ένα πακέτο την ημέρα ☐
Πάνω από ένα πακέτο την ημέρα ☐

γ. Για πόσα χρόνια καπνίζετε; .....

12. α. Καταναλώνετε αλκοολούχα ποτά; Ναι ☐ Όχι ☐

β. Εαν ναι, πόσα ποτά πίνετε την εβδομάδα;

Ένα ☐
Δύο ☐
Πάνω από δυο ☐

13. α. Αθλείστε; Ναι ☐ Όχι ☐

β. Πόσο συχνά αθλείστε;

Καθόλου ☐
1-2 φορές την εβδομάδα ☐
1-3 φορές την εβδομάδα ☐

14. Πόσα παιδιά έχετε (***<u>συμπληρώνω τον αριθμό και το φύλο</u>***)

Πόσα Αγόρια ☐ Πόσα Κορίτσια ☐

15. Από τα παιδιά σας στο Νηπιαγωγείο φοιτούν ☐ παιδιά φύλου Α ☐ ☐ λικίας ☐

16. Το παιδί που φοιτά στο Νηπιαγωγείο είναι το: 1° 2° 3° 4° 5° παιδί στην οικογένεια (***<u>κυκλώνω 1 μόνο απάντηση</u>***).

Β. ΕΝΟΤΗΤΑ

Ερωτήσεις διατροφικών συνηθειών γονέων

1. Γνωρίζετε της αρχές της Μεσογειακής διατροφής;
Ναι ☐ Όχι ☐ Δεν είμαι σίγουρος /η ☐

2. Πόσο αφοσιωμένοι πιστεύετε ότι είστε στο πρότυπο της Μεσογειακής διατροφής;
Καθόλου ☐
Λίγο ☐
Αρκετά

Πολύ ☐
πάρα πολύ ☐

3. Ποια από τα παρακάτω γεύματα καταναλώνετε ***εσείς, οι γονείς*** (***συμπληρώνω με √ στο παραλληλόγραμμο 1 έως και 6 επιλογές***):

	Τρώω	Δεν τρώω
1. πρωινό	☐	☐
2. δεκατιανό	☐	☐
3. μεσημεριανό	☐	☐
4. απογευματινό	☐	☐
5. βραδινό	☐	☐
6. κατά τη διάρκεια της νύχτας	☐	☐

4. Το βράδυ συνήθως *εσείς* τι ώρα τρώτε;

Δεν τρώω το βράδυ ☐
Δεν έχω καθορισμένη ώρα ☐
Πριν τις 20:00 ☐
Στις 20:00 ☐
Στις 21:00 ☐
Στις 22:00 ☐
Πιο αργά ☐

5. Για εσάς προσωπικά, το φαγητό αποτελεί κυρίως απόλαυση ή ανάγκη; (κυκλώστε 1 απάντηση)
1. Κυρίως απόλαυση
2. Κυρίως ανάγκη
3. Και τα δυο
4. Τίποτα από τα δυο

6. Υπάρχουν κάποιες τροφές που θα χαρακτηρίζατε ως ***υγιεινές*** και θα θέλατε ***οπωσδήποτε*** να τρώνε τα παιδιά σας;

.....
.....
.....
.....
.....
.....
.....
.....

7. Υπάρχουν κάποιες τροφές που, κατά τη γνώμη σας, είναι ***ανθυγιεινές*** και δεν θα θέλατε να τρώνε τα παιδιά σας;

.....
.....
.....
.....
.....
.....
.....

8. Πόσο συχνά τρώτε ***εκτός*** σπιτιού; (**κυκλώστε 1 απάντηση**)

1. Καθόλου
2. Λίγες φορές το χρόνο
3. Λίγες φορές το μήνα
4. Λίγες φορές την εβδομάδα
5. Κάθε μέρα

9. Αν τρώτε έξω κάποιες φορές την εβδομάδα, πόσες είναι αυτές συνήθως; .....

10. Όταν *βγαίνετε έξω* που τρώτε; (***συμπληρώνω με √ 1 επιλογή για κάθε απάντηση***)

	Καθόλου	Λίγο	Συχνά
1. Σε ταβέρνες / ψησταριές / εστιατόρια	☐	☐	☐
2. Σε ταχυφαγεία (fast food)	☐	☐	☐
3. Σε σουβλατζίδικα	☐	☐	☐
4. Σε μεζεδοπωλεία / ουζερί	☐	☐	☐
5. Σε πιτσαρίες	☐	☐	☐

6. Άλλο.....

11. Παίρνετε στο σπίτι έτοιμο φαγητό απ' έξω (delivery);

Ναι ☐ Όχι ☐

Αν ναι, πόσες ημέρες την εβδομάδα παίρνετε στο σπίτι έτοιμο φαγητό απ' έξω; .....

12. Όταν παίρνετε φαγητό απ' έξω συνήθως τι προτιμάτε;

1. Σουβλάκια
2. Πίτσες
3. Ελληνική κουζίνα – φαγητά εστιατορίου
4. Κουζίνα άλλης χώρας (π.χ. Κινέζικο, Μεξικάνικο κλπ).
   Συμπληρώστε τις επιλογές σας .....
5. Χάμπουργκερ / κλαμπ σάντουιτς
6. Μακαρονάδες

7. Κρέπες
8. Σαλάτες
9. Άλλο.....

13. Καταναλώνετε στο σπίτι προμαγειρεμένα ή προτηγανισμένα τρόφιμα;

Ναι ☐ Όχι ☐

Αν ναι, πόσες ημέρες την εβδομάδα καταναλώνετε προμαγειρεμένα ή προτηγανισμένα τρόφιμα;

.....

14. Πόσο συχνά καταναλώνετε μαγειρεμένο, σπιτικό φαγητό;

Καθόλου ☐
1-2 φορές την εβδομάδα ☐
3-5 φορές την εβδομάδα ☐
Κάθε μέρα ☐

15. πόσο συχνά υπάρχουν φρούτα και λαχανικά στο τραπέζι;

Λιγότερο από 1 φορά την εβδομάδα ☐
Τουλάχιστον 1 φορά την εβδομάδα ☐
3-5 φορές την εβδομάδα ☐
Κάθε μέρα ☐

16. α) Γνωρίζετε πόσες μερίδες φρούτων και λαχανικών πρέπει να καταναλώνει ένας ενήλικας ημερησίως;

Ναι ☐ όχι ☐

β) Αν ναι, πόσες;

1 μερίδα την εβδομάδα ☐
1 μερίδα την ημέρα ☐
3 μερίδες την ημέρα ☐
5 μερίδες την ημέρα ☐

Γ. ΕΝΟΤΗΤΑ
Ερωτήσεις διατροφικών συνηθειών παιδιών

1. Βάρος παιδιού (kg)…...

2. Ύψος παιδιού (cm).....

3. Ποια από τα παρακάτω γεύματα τρώνε *τα παιδιά σας* (***συμπληρώνω στο παραλληλόγραμμο τον αριθμό από 1 έως και 5 επιλογές***. Π.χ. Τρώει: 1,2,5 Δεν Τρώει: 1,5):

Τρώει ☐ δεν τρώει ☐

1. πρωινό
2. δεκατιανό
3. μεσημεριανό
4. απογευματινό
5. βραδινό
6. κυρίως ενδιάμεσα γεύματα τύπου σνακ χωρίς κυρίως γεύματα.
7. Δεν ξέρω / δεν απαντώ

4. Το *βράδυ* συνήθως *τα παιδιά* τι ώρα τρώνε;
1. Δεν τρώνε το βράδυ
2. Δεν έχουν καθορισμένη ώρα
3. Πριν τις 20:00
4. Στις 20:00
5. Στις 21:00
6. Στις 22:00
7. Πιο αργά

5. Συνήθως πού τρώει *πρωινό* το παιδί? (Βάλε √ στην απάντηση) ***Μόνο μία απάντηση σε κάθε γραμμή***

	1. Στο σπίτι	2.Στο σχολείο	3. Σε άλλο σπίτι συγγενικού ή μη προσώπου	4. Δεν ξέρω/Δεν απαντώ
1. Καθημερινές				
2. Σαββατοκύριακο				

6. Από Δευτέρα έως Παρασκευή πόσο συχνά τρώει πρωινό πριν φύγει για το σχολείο;

1-2 ημέρες ☐ 3-4 ημέρες ☐ και τις 5 ημέρες ☐ παραλείπει το πρωινό ☐

7. Σε περίπτωση που παραλείπει το πρωινό, για ποιο / ποιούς λόγους, κατά τη γνώμη σας συμβαίνει αυτό;

.....

.....

.....

.....

.....

.....

8. Συνήθως τι τρώει *στο σπίτι* για πρωινό; ***Μπορούν να δοθούν πολλαπλές απαντήσεις (κύκλωσε τις)***

1. Γάλα
2. Δημητριακά
3. Ψωμί
4. Φρούτα
5. Τυρόπιτα
6. Τυποποιημένα σκευάσματα (πχ κρουασάν, μπισκότα)
7. Γιαούρτι
8. Άλλο .....

9 Στο **γάλα του** βάζει:
άσπρη ζάχαρη ☐ μαύρη / καστανή ζάχαρη ☐ μέλι ☐ κακάο /hemo ☐ τίποτα ☐

10. Συνήθως τι τρώει ***στο σχολείο για δεκατιανό***; ***Μπορούν να δοθούν πολλαπλές απαντήσεις***

- Κάποιο **γαλακτοκομικό προϊόν**, (όπως γάλα, γιαούρτι, κρέμα αραβοσίτου, τυρί κλπ.):
  Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ αθόλου ☐
- **Δημητριακά με σοκολάτα / κακάο:**
- Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ αθόλου ☐
- **Δημητριακά ολικής αλέσεως:**
  Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ θόλου ☐
- **Άσπρα (σικάλεως) αρτοποιήματα (τοστ, ψωμί, κριτσίνια):**
- Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ θόλου ☐
- **Αρτοποιήματα ολικής αλέσεως (τοστ, ψωμί, κριτσίνια):**
  Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ θόλου ☐
- Κάποιο **φρούτο:**
  Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ θόλου ☐
- **Φρέσκος χυμός φρούτου:**
- Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ θόλου ☐
- **Χυμός φρούτου τυποποιημένος από σουπερμάρκετ:**
  Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ θόλου ☐
- **Κατανάλωση ξηρών καρπών:**
  ☐ ☐ ☐ ☐

- Κάθε μέρα 2-3 φορές την εβδομάδα 1 φορά την εβδομάδα καθόλου
- **Τρόφιμα ψημένα από το *εμπόριο*** (π.χ. φούρνους, όπως: τυρόπιτες, ζαμπονόπιτες, λουκανικόπιτες, σπανακόπιτες, σάντουιτς με τυρί και ζαμπόν, πίτσες, κ.α):

Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ καθόλου ☐

- ***Σπιτικά* γλυκά (κέικ, κρέπες, μπισκότα, σπιτικές μπάρες δημητριακών):**

Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ καθόλου ☐

- Καταναλώνουν **γλυκά του εμπορίου** (σοκολάτες, γκοφρέτες, kinder, μπισκότα, κουλούρια, κρουασάν, ντόνατς, λουκουμάδες, καραμέλες, γλειφιτζούρια, κέικ, ντόνατς, παγωτά κ.α.):

Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ καθόλου ☐

- ***Σπιτικές* πίτες:**

Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ καθόλου ☐

- **Σνακ του εμπορίου** (πατατάκια κλπ):

Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ καθόλου ☐

- Στο δεκατιανό τους περιλαμβάνεται **αυγό (βραστό ή ομελέτα):**

Κάθε μέρα ☐ 2-3 φορές την εβδομάδα ☐ 1 φορά την εβδομάδα ☐ καθόλου ☐

11. Συνήθως πού τρώει <u>μεσημεριανό</u> το παιδί; *Πρέπει να δοθεί μόνο μία απάντηση σε κάθε γραμμή* (Βάλε √ στην απάντηση)

	1. Στο σπίτι	2. Στον σχολείο	3. Σε άλλο σπίτι συγγενικού ή μη προσώπου	4. Δεν ξέρω/Δεν απαντώ
1. Καθημερινές				
2. Σαββατοκύριακο				

12. Το <u>***μεσημεριανό***</u> **των παιδιών *στο σχολείο*** περιλαμβάνει συνήθως:

- **Κατανάλωση λαχανικών** (φρέσκα, ωμά, σε σαλάτα ή μαγειρευτά):

Κάθε μέρα ☐ 1 φορά την εβδομάδα ☐ 2-3 φορές την εβδομάδα ☐
Λιγότερο από 1 φορά την εβδομάδα ☐ Καθόλου ☐

- **Ψάρι:**

Κάθε μέρα ☐ 1 φορά την εβδομάδα ☐ 2-3 φορές την εβδομάδα ☐
Λιγότερο από 1 φορά την εβδομάδα ☐ Καθόλου ☐

- **Θαλασσινά (καλαμάρι, χταπόδι, σουπιές, γαρίδες):**

Κάθε μέρα ☐ 1 φορά την εβδομάδα ☐ 2-3 φορές την εβδομάδα ☐
Λιγότερο από 1 φορά την εβδομάδα ☐ Καθόλου ☐

- **Κατανάλωση κόκκινου κρέατος (μοσχάρι):**

Κάθε μέρα ☐ 1 φορά την εβδομάδα ☐ 2-3 φορές την εβδομάδα ☐
Λιγότερο από 1 φορά την εβδομάδα ☐ Καθόλου ☐

- **Κατανάλωση άσπρου κρέατος (κοτόπουλο, γαλοπούλα):**

Κάθε μέρα ☐ 1 φορά την εβδομάδα ☐ 2-3 φορές την εβδομάδα ☐
Λιγότερο από 1 φορά την εβδομάδα ☐ Καθόλου ☐

- **Έτοιμο φαγητό από εστιατόριο fast food** (π.χ. hamburger):

Κάθε μέρα ☐ 1 φορά την εβδομάδα ☐ 2-3 φορές την εβδομάδα ☐
Λιγότερο από 1 φορά την εβδομάδα ☐ Καθόλου ☐

- **Κατανάλωση ζυμαρικών ή ρυζιού:**

Κάθε μέρα ☐ 1 φορά την εβδομάδα ☐ 2-3 φορές την εβδομάδα ☐
Λιγότερο από 1 φορά την εβδομάδα ☐ Καθόλου ☐

- **Κατανάλωση κάποιου φρούτου ή χυμού φρούτου μετά το μεσημεριανό τους:**

Κάθε μέρα ☐ 1 φορά την εβδομάδα ☐ 2-3 φορές την εβδομάδα ☐
Λιγότερο από 1 φορά την εβδομάδα ☐ Καθόλου ☐

- **Όσπρια (π.χ. φακές, φασόλια, ρεβύθια):**

Κάθε μέρα ☐ 1 φορά την εβδομάδα ☐ 2-3 φορές την εβδομάδα ☐
Λιγότερο από 1 φορά την εβδομάδα ☐ Καθόλου ☐

- **Κατανάλωση ελαιόλαδου στα φαγητά και τις σαλάτες τους:**

Κάθε μέρα ☐ 1 φορά την εβδομάδα ☐ 2-3 φορές την εβδομάδα ☐
Λιγότερο από 1 φορά την εβδομάδα ☐ Καθόλου ☐

13. Πόσο συχνά θα φάει το παιδί έξω σε φαστ-φουντ, σουβλατζίδικο ή πιτσαρία;
(***Πρέπει να δοθεί μόνο μία απάντηση***)

1. 4 ή περισσότερες φορές την εβδομάδα
2. 2-3 φορές την εβδομάδα
3. 1 φορά την εβδομάδα
4. 1-3 φορές τον μήνα
5. Λιγότερο από 1 φορά τον μήνα
6. Ποτέ
7. Δεν ξέρω/ Δεν απαντώ

14. Ποια ήταν η τελευταία φορά που έφαγε το παιδί σε ταχυφαγείο (φαστ-φουντ, σουβλατζίδικο, πιτσαρία); ***Πρέπει να δοθεί μόνο μία απάντηση***

1. Την τελευταία εβδομάδα
2. Τον τελευταίο μήνα
3. Τους τελευταίους 2-3 μήνες
4. Ποτέ

5. Δεν ξέρω / Δεν απαντώ

15. Ως γονείς σε ποιο βαθμό ελέγχετε τη διατροφή των παιδιών σας:

1. καθόλου ☐
2. όχι και τόσο ☐
3. μέτρια ☐
4. αρκετά ☐
5. πολύ ☐

16. Πόσο συχνά καταναλώνετε φρούτα και λαχανικά ***μαζί με*** το παιδί σας;

Καθόλου ☐

Τουλάχιστον 1 φορά την ημέρα ☐

2-3 φορές την ημέρα ☐

Περισσότερες από 3 φορές την ημέρα ☐

17. Εαν το παιδί σας αρνείται να καταλώσει φρούτα ή λαχανικά:

Δεν πιέζω το παιδί να το καταναλώσει ☐
Επιμένω στο να το καταναλώσει ☐

Του προσφέρω κάτι άλλο ☐

Παρακαλώ διευκρινείστε:

.....

.....

.....

18. Περίπου πόσες ημέρες την εβδομάδα καταναλώνετε στο σπίτι τις παρακάτω ομάδες τροφίμων; Βάλτε ☑

	Ποτέ	*Σπάνια (1 φορά)*	*Λίγες φορές (2-3 φορές)*	*Αρκετές φορές (4-5 φορές)*	*Σχεδόν καθημερινά (6-7 φορές)*
Ελαιόλαδο					
Λαχανικά					
Ζυμαρικά/ ρύζι					
Φρούτα					
Τυρί					
Όσπρια					
Ψωμί					
Κόκκινο κρέας					
Πουλερικά					
Πατάτες					
Γαλακτοκομικά					

Ψάρια					
Γλυκά					
Αυγά					
Αεριούχα ποτά (CocaCola, πορτοκαλάδα)					

19. Σε γενικές γραμμές, πόσο ενημερωμένοι αισθάνεστε για τη σήμανση των τροφίμων, δηλαδή για το σύνολο των πληροφοριών που αναγράφονται στις συσκευασίες των τροφίμων;

1. Καθόλου ενημερωμένοι
2. Όχι και τόσο ενημερωμένοι
3. Μέτρια ικανοποιημένοι
4. Αρκετά ενημερωμένοι
5. Πολύ ενημερωμένοι

20. Συνήθως εσείς, ή το άτομο από το νοικοκυριό που ψωνίζει, ελέγχετε τα προϊόντα διατροφής ως προς (**μπορείτε να κυκλώσετε περισσότερες από 1 απαντήσεις**):

1. Την ημερομηνία λήξης
2. Τη χώρα προέλευσης
3. Την ημερομηνία παραγωγής
4. Τα λιπαρά που περιέχουν
5. Τα συστατικά
6. Τα συντηρητικά που περιέχουν
7. Τα διατροφικά στοιχεί / θρεπτικές αξίες
8. Τα πρόσθετα που περιέχουν
9. Τις θερμίδες

21. Όταν αγοράζετε τρόφιμα, τι μετράει περισσότερο στις επιλογές που κάνετε;

.....
.....
.....
.....
.....

22. Έχει το παιδί αλλεργία σε κάποιο τρόφιμο; (***Πρέπει να δοθεί μόνο μία απάντηση***)

Ναι ☐

Σε ποιο;

.....

Όχι ☐

23. Αισθάνεστε ότι το βάρος που έχετε ***εσείς*** σήμερα είναι (***Πρέπει να δοθεί μόνο μία απάντηση)***:

1. περισσότερο από το κανονικό
2. περίπου το κανονικό
3. λιγότερο από το κανονικό

24. ***Εσείς*** έχετε προσπαθήσει ποτέ να χάσετε βάρος μέσω κάποιας δίαιτας;

Ναι ☐ Όχι ☐

Αν ναι, για ποιο λόγο; (***Πρέπει να δοθεί μόνο μία απάντηση)***:

1. Για μείωση του βάρους (είσασταν υπέρβαρος - η)
2. Για αύξηση του βάρους (Ελλιποβαρής)
3. Για ιατρικούς λόγους, όπως:

.....

.....

.....

.....

.....

.....

25. Αισθάνεστε ότι το βάρος που ***το παιδί σας*** που φοιτά στο νηπιαγωγείο έχει σήμερα είναι (***Πρέπει να δοθεί μόνο μία απάντηση)*****:**

1. περισσότερο από το κανονικό
2. περίπου το κανονικό
3. λιγότερο από το κανονικό

26. Πώς εκτιμάτε την ποσότητα φαγητού που τρώει ***το παιδί σας***; (***Πρέπει να δοθεί μόνο μία απάντηση)*****:**

1.Τρώει πολύ λίγο
2. Τρώει λίγο
3. Τρώει φυσιολογικές ποσότητες
4. Τρώει περισσότερο από το φυσιολογικό
5. Τρώει υπερβολικά

27. ***Το παιδί σας*** έχει υποβληθεί σε κάποια δίαιτα τον τελευταίο χρόνο;

Ναι ☐ Όχι ☐

Αν ναι, για ποιο λόγο; (***Πρέπει να δοθεί μόνο μία απάντηση)***:

1. Για μείωση του βάρους (Υπέρβαρο)
2. Για αύξηση του βάρους (Ελλιποβαρές)
3. Για ιατρικούς λόγους, όπως:

.....

.....

.....

.....

28. Συνήθως βγάζετε το λίπος (δέρμα) από το κρέας που τρώει το παιδί; ***(Πρέπει να δοθεί μόνο μίααπάντηση)***

1. Ναι
2. Όχι
3. Δεν ξέρω/Δεν απαντώ

29. Συνήθως με τι λάδι μαγειρεύετε; ***(Πρέπει να δοθεί μόνο μία απάντηση)***

1. Ελαιόλαδο
2. Σπορέλαιο
3. Βούτυρο
4. Μαργαρίνη
5. Άλλο .....

30. Κατά τη διάρκεια του τελευταίου χρόνου έχει πάρει το παιδί συμπληρώματα διατροφής για βιταμίνες και ιχνοστοιχεία; ***(Πρέπει να δοθεί μόνο μία απάντηση)***

1. Όχι
2. Ναι
3. Δεν ξέρω/ Δεν απαντώ

31. Πόσο συχνά βλέπει τηλεόραση, DVD ή tablet το παιδί όταν τρώει κάποιο γεύμα (πρωινό, μεσημεριανό, δείπνο, σνακ) στο σπίτι; ***Πρέπει να δοθεί μόνο μία απάντηση***

1. Σχεδόν ποτέ
2. Μερικές φορές
3. Συχνά
4. Σχεδόν πάντα

32. Πείτε μας εάν τους τελευταίους 12 μήνες έχετε αλλάξει τις αγοραστικές σας συνήθειες σε διάφορα τρόφιμα ***(λόγω οικονομικής κρίσης, διαθεσιμότητας προϊόντων, τιμών, για λόγους διατροφής ή υγείας)***.

Πρέπει να δοθεί μόνο μία απάντηση

1. Ναι
2. Όχι

33. Αν **ναι**, αναφέρετε τους **2 κυριότερους λόγους** που συμβαίνει αυτό.

1. Οι τιμές των προϊόντων (πχ η αύξηση στις τιμές των αγαθών ή η μείωση μισθού).
2. Διαθεσιμότητα προϊόντων
3. Διαθεσιμότητα χρόνου (περισσότερα προ-μαγειρεμένα, κατεψυγμένα, κονσερβοποιημένα)
4. Άλλος λόγος.....

.....

.....

34. Άλλαξε η αγορά τροφίμων για την οικογένειά σας τον τελευταίο χρόνο;
(Πρέπει να δοθεί μόνο μία απάντηση σε κάθε σειρά)

	ΑΥΞΗΣΗ ΚΑΤΑΝΑΛ	ΜΕΙΩΣΗ ΚΑΤΑΝΑΛ	ΚΑΜΙΑ ΑΛΛΑΓΗ
Φρούτα			
Λαχανικά			
Κρέας			
Ψάρια			
Γαλακτοκομικά			
Προπαρασκευασμένα φαγητά (πίτσα, λαζάνια, πίτες)			
Κατεψυγμένα Φρούτα/λαχανικά			

35. Συνοψίζοντας, εκτιμώντας τις διατροφικές συνήθειες των παιδιών σας (KIDMED) θα λέγατε ότι:

	Το παιδί σας:	***ΝΑΙ***	***ΟΧΙ***
1	Καταναλώνει ένα φρούτο ή χυμό φρούτου κάθε μέρα;		
2	Καταναλώνει κάποιο δεύτερο φρούτο κάθε μέρα;		
3	Καταναλώνει λαχανικά (φρέσκα, ωμά, σε σαλάτα ή μαγειρευτά) μια φορά την ημέρα.		
4	Καταναλώνει λαχανικά (φρέσκα, ωμά, σε σαλάτα ή μαγειρευτά) περισσότερο από μια φορά την ημέρα;		
5	Καταναλώνει τακτικά ψάρι, τουλάχιστον 2-3 φορές την εβδομάδα.		
6	Καταναλώνει πρόχειρο φαγητό τύπου fast food περισσότερο από 1 φορά την εβδομάδα;		
7	Του αρέσουν τα όσπρια και τα τρώει περισσότερες από 1 φορά την εβδομάδα;		
8	Καταναλώνει ψωμί, ζυμαρικά ή ρύζι σχεδόν κάθε μέρα (5 ή περισσότρες φορές την εβδομάδα);		
9	Για πρωινό καταναλώνει συνήθως δημητριακά (τύπου corn flakes) ή αρτοσκευάσματα (ψωμί, φρυγανιές κλπ);		
10	Καταναλώνει ξηρούς καρπούς τακτικά, τουλάχιστον 2-3 φορές εβδομαδιαίως;		
11	Καταναλώνει ελαιόλαδο στο σπίτι, είτε σε σαλάτα, είτε στο φαγητό;		
12	Συνήθως παραλείπει το πρωινό;		
13	Το πρωινό του περιλαμβάνει κάποιο γαλακτοκομικό προιόν, όπως γάλα, γιαούρτι κλπ.		
14	Καταναλώνει τρόφιμα ψημένα από το εμπόριο ή γλυκίσματα για πρωινό;		
15	Καταναλώνει 2 γιαούρτια και / ή 40 γρ. τυρί ημεησίως;		
16	Καταναλώνει γλυκά και ζαχαρωτά κάθε μέρα;		

APPENDIX 4:Physical Activity Questionnaire in preschoolers

ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ

ΤΟΜΕΑΣ ΚΟΙΝΩΝΙΚΗΣ ΙΑΤΡΙΚΗΣ
ΚΛΙΝΙΚΗ ΠΡΟΛΗΠΤΙΚΗΣ ΙΑΤΡΙΚΗΣ ΚΑΙ ΔΙΑΤΡΟΦΗΣ

ID _____

ΕΡΩΤΗΜΑΤΟΛΟΓΙΟ ΓΙΑ ΤΗΝ ΑΞΙΟΛΟΓΗΣΗ ΤΟΥ ΕΠΙΠΕΔΟΥ ΦΥΣΙΚΗΣ ΑΣΚΗΣΗΣ ΤΩΝ ΤΕΛΕΥΤΑΙΩΝ ΤΡΙΩΝ ΜΗΝΩΝ ΤΩΝ ΠΑΙΔΙΩΝ ΠΡΟΣΧΟΛΙΚΗΣ ΗΛΙΚΙΑΣ

ΑΝΘΡΩΠΟΜΕΤΡΙΚΑ ΚΑΙ ΔΗΜΟΓΡΑΦΙΚΑ ΣΤΟΙΧΕΙΑ

ΕΚΠΑΙΔΕΥΤΙΚΟ ΕΠΙΠΕΔΟ ΤΟΥ ΓΟΝΕΑ

Ποια είναι η πιο υψηλή βαθμίδα εκπαίδευσης που έχετε συμπληρώσει ;

1. Δεν πήγα σχολείο
2. Δημοτικό σχολείο χωρίς να το ολοκληρώσω, αλλά μπορώ να διαβάσω και να γράψω
3. Τελείωσα το δημοτικό σχολείο
4. Ολοκλήρωσα την _____τάξη του Γυμνασίου
5. Τελείωσα γυμνάσιο
6. Ολοκλήρωσα την _____τάξη του Λυκείου
7. Τελείωσα λύκειο
8. Φοίτησα _____ χρόνια σε ανώτερη σχολή
9. Τελείωσα Ανωτέρα Σχολή (ΚΑΤΕΕ/ ΣΕΛΕΤΕ)
10. Φοίτησα _____χρόνια σε πανεπιστημιακή σχολή
11. Τελείωσα το πανεπιστήμιο (ΑΕΙ/ ΤΕΙ)
12. Άλλες σπουδές (Μεταπτυχιακό / διδακτορικό)
13. Δεν ξέρω/ Δεν απαντώ

Τώρα θα ήθελα να σας κάνω κάποιες ερωτήσεις που αφοορούν τη φυσική δραστηριότητα του παιδιού σας, θα ήθελα να μου απαντήσετε σε αυτές με βάση το χρονικό διάστημα του τελευταίου τριμήνου.

ΣΤΟΙΧΕΙΑ ΦΥΣΙΚΗΣ ΑΣΚΗΣΗΣ

1. Πόσα λεπτά είναι συνήθως ο ύπνος του παιδιού κατά τη διάρκεια της ημέρας ;

1.1. Στο σχολείο: _____λεπτά 1.2. Στο σπίτι: _____λεπτά

2. Πόσο χρόνο περνάει το παιδί σας παρακολουθώντας τηλεόραση ή βλέποντας βίντεο; (*Χωρίς να λάβετε υπόψη σας το χρόνο που το παιδί σας παίζει βιντεοπαιχνίδια*)

2.1. Τις καθημερινές: Ώρες:_____Λεπτά:_____

2.2. Το Σαββατοκύριακο: Ώρες:_____Λεπτά:_____

3. Εκτός σχολείου πόσο χρόνο περνάει το παιδί σας παίζοντας παιχνίδια σε καθιστή θέση (πχ: πάζλ, βιβλία, κούκλες/ στρατιωτάκια, εργασίες σπιτιού, υπολογιστή/ βιντεοπαιχνίδια)**;** {***Χωρίς να λάβετε υπόψη σας το χρόνο που το παιδί σας βλέπει τηλεόραση***}

3.1. Τις καθημερινές: Ώρες:_____Λεπτά:_____

3.2. Το σαββατοκύριακο: Ώρες:_____Λεπτά:_____

4. Κατά τη διάρκεια μιας τυπικής εβδομάδας θα ήθελα να μου πείτε με βάση αυτά που σας έχει πει το παιδί σας ή η δασκάλα του παιδιού σας εάν το παιδί σας συμμετέχει σε οργανωμένες δραστηριότητες <u>κατά τη διάρκεια του σχολείου</u>;

1. Ναι
1.1. Αν ναι, παρακαλώ διευκρινείστε: .....
2. Όχι **(Συνέχεια στην ερώτηση 5)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 5)**

5. Παίζει το παιδί σας <u>*μπάσκετ*</u> στην αυλή του σχολείου;

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 6)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 6)**

5.1. Εάν Ναι, πόσες φορές τις καθημερινές
5.2. Για πόσα λεπτά

6. Παίζει το παιδί σας <u>*ποδόσφαιρο*</u> στην αυλή του σχολείου;

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 7)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 7)**

6.1 Εάν Ναι, Πόσες Φορές τις καθημερινές
6.2 Για πόσα λεπτά

7. Κάνει το παιδί σας <u>*γυμναστική ή μουσικοκινητικά παιχνίδια*</u> στο σχολείο;

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 8)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 8)**

7.1 Εάν Ναι, πόσες φορές τις καθημερινές
7.2 Και για πόσα λεπτά

8. Κατά την διάρκεια παραμονής του παιδιού σας στο σχολείο, πιστεύετε ότι το παιδί σας περνάει/ περνούσε κάποιον χρόνο παίζοντας στην αυλή ή μέσα στο σχολείο και με ένταση:

8.1. Ήρεμα κυρίως από καθιστή θέση

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 8.2)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 8.2)**

8.1.1 Εάν Ναι, πόσες φορές τις καθημερινές
8.1.2 Και για πόσα λεπτά

8.2. Κινούμενο αρκετά συχνά αλλά κάποιες φορές κάθεται ή στέκεται

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 8.3)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 8.3)**

8.2.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
8.2.2 Και για πόσα λεπτά .....

8.3. Τρέχοντας πηδώντας ενεργητικά σχεδόν την περισσότερη ώρα.

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 9)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 9)**

8.3.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
8.3.2 Και για πόσα λεπτά .....

9. Παίζει το παιδί σας σε όργανα παιδικής χαράς στην αυλή κατά τη διάρκεια του σχολείου;

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 10)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 10)**

9.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
9.2 Και για πόσα λεπτά .....

10. Κάνει το παιδί σας κάποια άλλη δραστηριότητα κατά τη διάρκεια του σχολείου;

1. Ναι.

Η δραστηριότητα αυτή είναι:

.....

2. Όχι **(Συνέχεια στην ερώτηση 11)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 11)**

Παρακαλώ διευκρινείστε

10.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
10.2 Και για πόσα λεπτά .....

11. Τώρα θα ήθελα να μου πείτε για το χρονικό διάστημα <u>ΕΚΤΟΣ ΣΧΟΛΕΙΟΥ</u> κάνει το παιδί σας κάποια οργανωμένη δραστηριότητα; (πχ: παρακολουθεί μαθήματα χορού ή κολύμβησης) (Διευκρινίστε τις δραστηριότητες).

1. Ναι

1.1. Παρακαλώ διευκρινείστε:

.....

.....

2. Όχι **(Συνέχεια στην ερώτηση 12)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 12)**

12. Παίζει το παιδί σας κάποιο *<u>μουσικό όργανο</u>*;

1. Ναι

1.1. Αυτό είναι: .....

2. Όχι **(Συνέχεια στην ερώτηση 13)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 13)**

12.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
12.2 Και για πόσα Λεπτά

12.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
12.4 Και για πόσα λεπτά

13. Παίζει το παιδί σας *μπάσκετ* ;
1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 14)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 14)**

13.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
13.2 Και για πόσα λεπτά .....
13.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
13.4 Και για πόσα λεπτά .....

14. Παίζει το παιδί σας *ποδόσφαιρο*;
1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 15)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 15)**

14.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
14.2 Και για πόσα λεπτά .....
14.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
14.4 Και για πόσα λεπτά .....

15. Κάνει το παιδί σας *μαθήματα Μπαλέτου/ Χορού*;
1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 16)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 16)**

15.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
15.2 Και για πόσα λεπτά .....
15.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
15.4 Και για πόσα λεπτά .....

16. Κάνει το παιδί σας *κολύμβηση*;
1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 17)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 17)**

16.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
16.2 Και για πόσα λεπτά .....
16.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
16.4 Και για πόσα λεπτά .....

17. Κάνει το παιδί σας *γυμναστική*;
1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 18)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 18)**

17.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
17.2 Και για πόσα λεπτά .....
17.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
17.4 Και για πόσα λεπτά .....

18. Κάνει το παιδί σας *Πολεμικές Τέχνες* (καράτε, τζούντο κτλ);

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 19)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 19)**

18.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
18.2 Και για πόσα λεπτά .....
18.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
18.4 Και για πόσα λεπτά .....

19. Κάνει το παιδί σας *Ιππασία*;
1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 20)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 20)**

19.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
19.2 Και για πόσα λεπτά .....
19.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
19.4 Και για πόσα λεπτά .....

20. Κάνει το παιδί σας μαθήματα *Τέννις*;
1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 21)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 21)**

20.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
20.2 Και για πόσα λεπτά .....
20.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
20. 4 Και για πόσα λεπτά .....

21. Κατά την διάρκεια που το παιδί σας βρίσκεται ***εκτός σχολείου*** περνάει κάποιον χρόνο παίζοντας στην παιδική χαρά ή σε κάποιο παιδότοπο και με ένταση; Παρακαλώ διευκρινείστε:

21.1. Ήρεμα κυρίως από καθιστή θέση
1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 21.2)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 21.2)**

21.1.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
21.1.2 Και για πόσα λεπτά .....
21.1.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
21.1.4 Και για πόσα λεπτά .....

21.2. Κινούμενο αρκετά συχνά αλλά κάποιες φορές κάθεται ή στέκεται
1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 21.3)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 21.3)**

21.2.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
21.2.2 Και για πόσα λεπτά .....
21.2.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
21.2.4 Και για πόσα λεπτά .....

21.3. Τρέχοντας πηδώντας ενεργητικά σχεδόν την περισσότερη ώρα.

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 22)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 22)**

21.3.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
21.3.2 Και για πόσα λεπτά .....
21.3.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
21.3.4 Και για πόσα λεπτά .....

22. *Κολυμπάει* το παιδί σας στην παραλία (χρόνος παραμονής του παιδιού στο νερό);

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 23)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 23)**

22.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
22.2 Και για πόσα λεπτά .....
22.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
22.4 Και για πόσα λεπτά .....

23. Κατά το χρονικό διάστημα που το παιδί σας βρίσκεται στην παραλία *παίζει στην άμμο*;

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 24)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 24)**

23.1 Εάν Ναι, πόσες πορές τις καθημερινές .....
23.2 Και για πόσα λεπτά .....
23.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
23.4 Και για πόσα λεπτά .....

24. *Τρέχει* το παιδί σας συνήθως *με μέτρια ένταση* μέσα ή έξω από το σπίτι (τρέξιμο, παιχνίδι με την μπάλα, κυνηγητό με τα αδέρφια του κτλ);

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 25)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 25)**

24.1 Εάν Ναι, πόσες φορές τις καθημερινές _____
24.2 Και για πόσα λεπτά_____
24.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο_____
24.4 Και για πόσα λεπτά_____

25. *Τρέχει* το παιδί σας *με αυξημένη ένταση* χοροπηδώντας μέσα ή έξω από το σπίτι συνήθως (τρέξιμο, παιχνίδι με την μπάλα, κυνηγητό με τα αδέρφια του κτλ);

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 26)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 26)**

25.1 Εάν Ναι, πόσες φορές τις καθημερινές _____
25.2 Και για πόσα λεπτά_____
25.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο_____
25.4 Και για πόσα λεπτά_____

26. Κάνει το παιδί σας *ποδήλατο*;

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 27)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 27)**

26.1 Εάν Ναι, πόσες φορές τις καθημερινές _____
26.2 Και για πόσα λεπτά_____
26.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο_____
26.4 Και για πόσα λεπτά_____

27. *Χορεύει* το παιδί σας *στο σπίτι*;

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 28)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 28)**

27.1 Εάν Ναι, πόσες φορές τις καθημερινές _____
27.2 Και για πόσα λεπτά _____
27.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο_____
27.4 Και για πόσα λεπτά _____

28. Πηγαίνετε με το παιδί σας *βόλτα για περπάτημα*;

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 29)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 29)**

28.1 Εάν Ναι, πόσες φορές τις καθημερινές _____
28.2 Και για πόσα λεπτά _____
28.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο_____
28.4 Και για πόσα λεπτά _____

29. Κάνει το παιδί σας *σχοινάκι*;

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 30)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 30)**

29.1 Εάν Ναι, πόσες φορές τις καθημερινές _____
29.2 Και για πόσα λεπτά _____
29.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο_____
29.4 Και για πόσα λεπτά _____

30. Κάνει το παιδί σας τραμπολίνο ή κάποια δραστηριότητα στην οποία να αιωρείται ή να ταλαντεύεται;

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 31)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 31)**

30.1 Εάν Ναι, Πόσες Φορές τις καθημερινές _____
30.2 Και για πόσα Λεπτά _____
30.3 Εάν Ναι, Πόσες Φορές το σαββατοκύριακο_____
30.4 Και για πόσα Λεπτά _____

31. Κάνει το παιδί σας παιδικό *πατίνι;*

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 32)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 32)**

31.1 Εάν Ναι, πόσες φορές τις καθημερινές _____
31.2 Και για πόσα λεπτά _____
31.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο_____
31.4 Και για πόσα λεπτά _____

32. Κάνει το παιδί σας *πατινάζ*;

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 33)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 33)**

32.1 Εάν Ναι, πόσες φορές τις καθημερινές .....
32.2 Και για πόσα λεπτά .....
32.3 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
32.4 Και για πόσα λεπτά .....

33. Κάνει το παιδί σας κάποια άλλη δραστηριότητα ***εκτός σχολείου***

1. Ναι
2. Όχι **(Συνέχεια στην ερώτηση 34)**
3. Δεν ξέρω / Δεν απαντώ **(Συνέχεια στην ερώτηση 34)**

33.1 Παρακαλώ διευκρινίστε .....
33.2 Εάν Ναι, πόσες φορές τις καθημερινές .....
33.3 Και για πόσα επτά .....
33.4 Εάν Ναι, πόσες φορές το Σαββατοκύριακο .....
33.5 Και για πόσα λεπτά .....

34. Σε ποιο μέρος το παιδί παίζει συνήθως εκτός σπιτιού; ***(μία απάντηση)***

1. Παιδική Χαρά
2. Στο πεζοδρόμιο
3. Παίζει στο προαύλιο του σπιτιού
4. Στο πάρκο (που δεν έχει παιδική χαρά)
5. Άλλο (παρακαλώ, διευκρινίστε) .....

35. Πόσο μακριά είναι αυτό το μέρος χρησιμοποιώντας το πιο συνηθισμένο μέσο μεταφοράς (εάν είναι κάποιο άλλο μέσο που συνδυάζεται και με περπάτημα <u>πάνω από 10 λεπτά</u> παρακαλώ διευκρινίστε και τα 2); ***(πολλαπλές απαντήσεις)***

1. Με τα πόδια _ _ _ _ _ λεπτά
2. Με αμάξι/ ταξί _ _ _ _ _λεπτά
3. Με λεωφορείο _ _ _ _ _λεπτά
4. Με ποδήλατο _ _ _ _ __λεπτά
5. Άλλο (παρακαλώ διευκρινίστε) _ _ _ _ ___λεπτά

36. Ποιες είναι οι 2 πιο συνηθισμένες δραστηριότητες ή αθλήματα του παιδιού σας; ***(πολλαπλές απαντήσεις)***

1. Ποδήλατο/ Τρίκυκλο/ Πατίνι
2. Ποδόσφαιρο
3. Τρέξιμο/ Άλματα
4. Κολύμπι
5. Άλλο (παρακαλώ, διευκρινίστε)

.....

6. Δεν γνωρίζω / δεν απαντώ

37. Συνολικά, λαμβάνοντας υπόψη όλες τις φυσικές δραστηριότητες του, πιστεύετε ότι το παιδί σας: ***(κυκλώστε μία απάντηση)***

1. **Κάνει καθιστική ζωή:** κάθεται τον περισσότερο χρόνο , χωρίς να κάνει φυσικές δραστηριότητες ή αθλήματα.
2. **Είναι λίγο δραστήριο:** κάνει κυρίως δραστηριότητες από καθιστή θέση, είναι περιορισμένες οι φυσικές δραστηριότητες ή αθλήματα που πραγματοποιεί.
3. **Είναι μετρίως δραστήριο:** δεν περνάει πολύ χρόνο σε καθιστή θέση, κάνει ήπιες φυσικές δραστηριότητες ή αθλήματα .
4. **Είναι αρκετά δραστήριο:** σχεδόν πάντα βρίσκεται στην όρθια θέση, κάνει συχνά φυσικές δραστηριότητες και αθλήματα την εβδομάδα.
5. **Είναι πολύ δραστήριο:** σχεδόν πάντα στέκεται ή κινείται, κάνει συχνά φυσικές δραστηριότητες ή αθλήματα την ημέρα.
6. **Δεν ξέρω/ Δεν απαντώ**

38/ 39. Πόσο χρόνο αφιερώνετε εσείς και ο πατέρας του παιδιού κάνοντας κάποια φυσική δραστηριότητα (συμπεριλαμβάνοντας ποδηλασία, γυμναστική, οργανωμένα αθλήματα) κάθε εβδομάδα; ***(μία απάντηση)***

	12. Μητέρα	**13. Πατέρας**
1. Σχεδόν καθόλου	1____1	1____1
2. ~1/2 Ώρα την εβδομάδα	1____1	1____1
3. >1/2 - 1 Ώρα την εβδομάδα	1____1	1____1
4. 1-2 Ώρες (≈10-20 λεπ. / ημέρα)	1____1	1____1
5. >2-4 Ώρες (≈20-35λεπ./ ημέρα)	1____1	1____1
6.>4-7 Ώρες (≈35-60 λεπ./ ημέρα)	1____1	1____1
7. >7 Ώρες (>60 λεπ. / ημέρα)	1____1	1____1
8. Δεν ξέρω / Δεν απαντώ		

40/41. Πόσο χρόνο παρακολουθείτε τηλεόραση ή χρησιμοποιείτε τον υπολογιστή σας την ημέρα στον ελεύθερο σας χρόνο (για μία τυπική εβδομάδα) ***(μία απάντηση)***

		Καθόλου	**<1 ώρα**	**1-2 ώρες**	**3-4 ώρε ς**	**>4 ώρες**	**Δεν ξέρω/ Δεν απαντώ**
14. Μητέρα	Τις καθημερινές						
14. Μητέρα	Το Σαββατοκύριακο						
15. Πατέρας	Τις καθημερινές						
15. Πατέρας	Το Σαββατοκύριακο						

9

	Διατροφική Συμπεριφορά Παιδιού	Ποτέ	Σπάνια	Μερικές φορές	Συχνά	Πάντα	ΔΞ/Δ Α
1	Το παιδί σας αγαπάει το φαγητό	□	□	□	□	□	□
2	Το παιδί σας τρώει περισσότερο όταν είναι ανήσυχο	□	□	□	□	□	□
3	Το παιδί σας έχει πολύ όρεξη	□	□	□	□	□	□
4	Το παιδί σας τελειώνει το γεύμα του πολύ γρήγορα	□	□	□	□	□	□
5	Το παιδί σας ενδιαφέρεται για το φαγητό	□	□	□	□	□	□
6	Το παιδί σας ζητάει συνεχώς κάποιο υγρό (ρόφημα)	□	□	□	□	□	□
7	Το παιδί σας αρνείται στην αρχή τα καινούργια τρόφιμα	□	□	□	□	□	□
8	Το παιδί σας τρώει αργά	□	□	□	□	□	□
9	Το παιδί σας τρώει λιγότερο όταν είναι θυμωμένο	□	□	□	□	□	□
10	Το παιδί σας χαίρεται να δοκιμάζει καινούργια τρόφιμα	□	□	□	□	□	□
11	Το παιδί σας τρώει λιγότερο όταν είναι κουρασμένο	□	□	□	□	□	□
12	Το παιδί σας ζητάει συνεχώς φαγητό	□	□	□	□	□	□
13	Το παιδί σας τρώει περισσότερο όταν είναι ενοχλημένο	□	□	□	□	□	□
14	Εάν του επιτρεπόταν, το παιδί σας θα έτρωγε πάρα πολύ	□	□	□	□	□	□
15	Το παιδί σας τρώει περισσότερο όταν είναι αγχωμένο	□	□	□	□	□	□
16	Στο παιδί σας αρέσει μια μεγάλη ποικιλία τροφίμων	□	□	□	□	□	□
17	Το παιδί σας όταν τελειώνει το γεύμα του, αφήνει φαγητό στο πιάτο	□	□	□	□	□	□
18	Το παιδί σας χρειάζεται περισσότερα από 30 λεπτά για να τελειώσει το γεύμα του	□	□	□	□	□	□
19	Εάν του δινόταν η ευκαιρία, το παιδί σας θα έτρωγε την περισσότερη ώρα	□	□	□	□	□	□
20	Το παιδί σας ανυπομονεί για την ώρα του φαγητού	□	□	□	□	□	□
21	Το παιδί σας χορταίνει πριν τελειώσει το γεύμα του	□	□	□	□	□	□
22	Το παιδί σας απολαμβάνει το φαγητό	□	□	□	□	□	□
23	Το παιδί σας τρώει περισσότερο όταν είναι χαρούμενο	□	□	□	□	□	□

		Ποτέ	Σπάνια	Μερικές φορές	Συχνά	Πάντα	ΔΞ/Δ Α
24	Είναι δύσκολο το παιδί σας να το ευχαριστήσετε με τα γεύματα	□	□	□	□	□	□
25	Το παιδί σας τρώει λιγότερο όταν είναι νευριασμένο	□	□	□	□	□	□
26	Το παιδί σας χορταίνει εύκολα	□	□	□	□	□	□
27	Το παιδί σας τρώει περισσότερο όταν δεν έχει τίποτα άλλο να κάνει	□	□	□	□	□	□
28	Ακόμα και όταν το παιδί σας έχει χορτάσει, μπορεί να φάει το αγαπημένο του φαγητό	□	□	□	□	□	□
29	Εάν του δινόταν η ευκαιρία, το παιδί σας θα έπινε κάτι συνέχεια μέσα στη μέρα	□	□	□	□	□	□
30	Το παιδί σας δεν μπορεί να φάει φαγητό, αν έχει προηγουμένως φάει κάποιο σνακ	□	□	□	□	□	□
32	Το παιδί σας βρίσκει ενδιαφέρον να δοκιμάζει τρόφιμα που δεν έχει ξαναδοκιμάσει	□	□	□	□	□	□
33	Το παιδί σας αποφασίζει ότι δεν του αρέσει κάποιο φαγητό, ακόμα και αν δεν το έχει δοκιμάσει	□	□	□	□	□	□
34	Εάν του δινόταν η ευκαιρία, το παιδί σας θα μασουλούσε κάτι όλη την ώρα	□	□	□	□	□	□
35	Το παιδί σας τρώει όλο και πιο αργά κατά τη διάρκεια ενός γεύματος	□	□	□	□	□	□
36	Το παιδί σας βλέπει τηλεόραση την ώρα του φαγητού	□	□	□	□	□	□

		Διαφωνώ	Διαφωνώ λίγο	Ούτε διαφωνώ/ ούτε συμφωνώ	Συμφωνώ λίγο	Συμφωνώ
37	Φυλάσσετε σκόπιμα κάποια τρόφιμα σε μέρη που δεν μπορεί να βρει το παιδί	□	□	□	□	□
38	Δίνετε στο παιδί σας τα αγαπημένα του τρόφιμα ως αντάλλαγμα για καλή συμπεριφορά	□	□	□	□	□
39	Το παιδί σας θα πρέπει να φάει όλο το φαγητό που έχει στο πιάτο του	□	□	□	□	□
40	Ακόμα και όταν το παιδί σας λέει « δεν πεινάω», προσπαθείτε να το ταΐσετε έτσι κι αλλιώς	□	□	□	□	□
41	Εάν δεν κατευθύνετε ή ρυθμίσετε το τι τρώει το παιδί σας, θα φάει πολύ λιγότερο από αυτό που πρέπει	□	□	□	□	□

42. Το παιδί σας στην ηλικία των ☐ ετών που βρίσκεται πιστεύετε ότι έχει…

1. Ιδιαίτερα αυξημένο βάρος
2. Χαμηλό βάρος
3. Φυσιολογικό βάρος
4. Αυξημένο βάρος
5. Ιδιαίτερα αυξημένο βάρος
6. Δεν Ξέρω/ Δεν Απαντώ.

43. Σχόλια ερευνητή

1. Ικανοποιητική συμπλήρωση
2. Ολοκλήρωση σε περισσότερες από 1 επαφές.
3. Μη ικανοποιητική συμπλήρωση ερωτηματολογίου λόγω απροθυμίας
4. Μη ικανοποιητική συμπλήρωση ερωτηματολογίου λόγω μη κατανόησης των ερωτήσεων.

APPENDIX 5: APPENDIX 5: Certificate of acceptance for publication of the manuscript entitled "Family and individual dietary and lifestyle habits as predictors of BMI and KIDMED Score in Greek and immigrant preschoolers" by Maria Chrissini, Dimitra Sifaki – Pistolla, Nikolaos Tzanakis, IoannaTsiligianni, in the Journal *Archives of the Balcan Medical Union*

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CERTIFICATE

This is to certify that the article "Family and individual dietary and lifestyle habits as predictors of BMI and Kidmed Score in Greek and immigrant preschoolers" by Maria Chrissini, Dimitra Sifaki-Pistolla, Nikolaos Tzanakis, Ioanna Tsiligianni, has been accepted for publication by the editorial board of the journal "*Archives of the Balkan Medical Union*", ISSN 1584-9244, www.umbalk.org, and it will be published in issue 4/2019 (December 2019).

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10 October 2019

Assoc Prof Dr. Camelia Diaconu
Editor-in-Chief "*Archives of the Balkan Medical Union*"

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APPENDIX 6: ACCEPTED MANUSCRIPT FOR PUBLICATION

ORIGINAL PAPER

FAMILY AND INDIVIDUAL DIETARY AND LIFESTYLE HABITS AS PREDICTORS OF BMI AND KIDMED SCORE IN GREEK AND IMMIGRANT PRESCHOOLERS

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ABSTRACT

Introduction: in our multicultural society the global pandemia of obesity consists the severest form of overweight, affecting young children, with individual and parental dietary and lifestyle factors being associated with OW/OB among preschoolers.

The objective of the study was to assess the parental dietary and lifestyle trajectories that predict and determine native Greek and immigrant preschoolers' BMI and KIDMED score.

Material and methods:578 guardian parents and 578 preschoolers (5-6 year-old), both native Greeks (n=451) and other nationalities (n=127) participated in this cross-sectional study. The Food Frequency Questionnaire and KIDMED scores were utilized.

Results: Significantly high level of concordance of guardian parents' and preschoolers' dietary habits (Spearman's rho= 0.94, R^2=0.91, p <0.001) was revealed. The strongest predictors significantly increasing BMI in preschoolers (p <0.05) were: low levels of KIDMED score, low frequency of removing fat from meat prior eating, low parental frequency of following Mediterranean Diet. Contrariwise, regular family's breakfast and brunch consumption, high frequency of consuming vegetables or fruits and physically active parents who control preschoolers' diet, were predictors of diminishing the risk for high BMI in children. Child's increased physical activity and parents' frequency of following the Mediterranean Diet were found to decrease the risk for low KIDMED score in preschoolers.

Conclusions: Both Greek and other nationalities' guardian parents' lifestyle characteristics, dietary habits and choices act as determinants either reinforcing or aggravating preschoolers' health outcomes. Families should promote optimal dietary habits for better health outcomes.

Keywords: preschoolers, immigrants, BMI, KIDMED score, dietary habits, Mediterranean Diet.

Abbreviations list:

WHO = World Health Organization

MVPA = Moderate to Vigorous Physical ActivitySES = Socio-Economic Status

PA = Physical ActivityFFQ = Food Frequency QuestionnaireMD = Mediterranean Diet

BMI = Body Mass IndexL-VPA = Light to Vigorous Physical Activities

OW/OB = Overweight/Obesity

KIDMED = Mediterranean Diet Quality Index

RESUME

Introduction: dans notre société multiculturelle, la pandémie mondiale d'obésité constitue la forme la plus sévère de surpoids qui touche les jeunes enfants; des facteurs alimentaires et de style de vie individuels et parentaux sont associés à la survenue de TA / OB chez les enfants d'âge préscolaire.

L'objectif de l'étude était d'évaluer les trajectoires alimentaires et de style de vie des parents qui permettent de prédire et de déterminer l'IMC et le score de KIDMED pour les enfants grecs et immigrés.

Matériel et méthodes: 578 parents gardiens et 578 enfants d'âge préscolaire (âgés de 5 à 6 ans), des Grecs autochtones (n = 451) et d'autres nationalités (n = 127) ont participé à cette étude transversale. Le questionnaire sur la fréquence des repas et les scores KIDMED ont été utilisés.

Résultats: Un niveau de concordance significativement élevé entre les habitudes alimentaires des parents gardiens et des enfants d'âge préscolaire (rho de Spearman = 0,94, R2 = 0,91, p <0,001) a été révélé. Les prédicteurs les plus puissants augmentant de manière significative l'IMC chez les enfants d'âge préscolaire (p <0,05) étaient: les faibles niveaux de score KIDMED, la faible fréquence d'élimination des graisses de la viande avant l'alimentation, la faible fréquence parentale de la diète méditerranéenne. En revanche, la consommation régulière de petits-déjeuners et de brunch en famille, la consommation fréquente de légumes ou de fruits et les parents physiquement actifs qui contrôlent le régime alimentaire des enfants d'âge préscolaire étaient des prédicteurs de la diminution du risque d'IMC élevé chez les enfants. L'activité physique accrue de l'enfant et la fréquence avec laquelle les parents suivent le régime méditerranéen diminuent le risque de faible score KIDMED chez les enfants d'âge préscolaire.

Conclusions: Les caractéristiques du mode de vie, les habitudes et les choix alimentaires des parents gardiens, grecs et d'autres nationalités, jouent un rôle déterminant dans le renforcement ou l'aggravation des résultats pour la santé des enfants d'âge préscolaire. Les familles devraient promouvoir des habitudes alimentaires optimales pour de meilleurs résultats en matière de santé.

Mots clés:enfants d'âge préscolaire, immigrants, IMC, score KIDMED, habitudes alimentaires, régime méditerranéen

INTRODUCTION

The World Health Organization (WHO) illustrates the global pandemia of obesity as the severest form of overweight, affecting children both in developed and developing countries.[1]A worldwide increase in levels of overweight/obesity (OW/OB) in preschool age has been reported, while 2020 projections predict a rise to 9.1%.[59] Countries of the Mediterranean region and the British islands report the highest rates of overweight/obesity in preschoolers, while the lowest scores are reported in central, middle, eastern and northern European countries.[61]

The etiology of early childhood OW/OB, which still remains an understudied issue,[11]is multidimensional and encompasses genetic (i.e. gender, age) and environmental factors (i.e. ethnicity, socio-economic status, parental weight status, parental lifestyle and dietary intake habits).[72,188] Parental BMI scores are significantly linked with child's BMI and levels of adherence to the Mediterranean Diet (MD);[10] an important health-promoting pattern for children[129] measured by the Mediterranean Diet Quality Index for children (KIDMED score). Preschool children in the Mediterranean countries of the EU, however, exhibited low adherence to the Mediterranean-like diet, which in turn was associated with early rates of OW/OB.[67,46] Although OW/OB rates are more prevalent in low Socio-Economic Status (SES) and ethnic minority groups,[60] the relationship of these socio-demographic variables with parental feeding practices and culture[262] is still under-examined.

Apart from parental dietary and overall lifestyle, additional individual-level behaviors could directly affect preschoolers' BMI. For instance, preschoolers are believed to be highly physically active,[263] nevertheless, they are highly susceptible to early adoption of obesogenic lifestyles, due to their engagement in fairly low levels of moderate to vigorous physical activity (MVPA).[264]Furthermore, longer periods of TV viewing have been identified as an important modulator of the risk of greater BMI and OW/OB in preschoolers.[9,219]

Although OW/OB rates in preschoolers in Greece are reported[265] among the highest worldwide (17.5% and 16.2%, respectively), empirical data on the individual and parental dietary and lifestyle habits of preschoolers of different ethnicity and their impact on children's BMI are limited.[11,71] The present study constitutes the first cross-sectional study that seeks to fill the gap in the current literature by identifying early determinants of early childhood overweight/obesity in both native Greek and ethnic minority preschoolers in Greece.

THE PRIMARY OBJECTIVE OF THE STUDY was to investigate the individual and parental dietary and lifestyle factors associated with OW/OB among preschoolers attending kindergartens in Attica region, Greece. Additional objectives were set to further explore level of potential correlation of guardian parents' and preschoolers' dietary habits, to identify predictors of high and low preschoolers' BMI, as well as predictors of low KIDMED score.

MATERIAL AND METHODS

Study design and participants

This cross-sectional study was conducted in Attica region (largest administrative region in Greece, including the capital city), during the school year 2016-2017. The study population consisted of preschoolers aged 5 to 6 years, attending public kindergarten and their guardian parent.

The terms ethnic group or population were determined as "a group of people smaller in number than the majority categories, who by their customs, language, race, values, and group interests differ from the majority population".[38] The framework of ethnicity in our study, similarly to other cross-sectional studies,[182] was defined according to the preschoolers' and their guardian parents' country of birth. Specifically, participants were considered of non-Greek ethnicity if: (1) born outside Greece and at least one parent born outside Greece (i.e. first generation); or (2) born in Greece, but both parents born outside Greece (i.e. second generation) and migrated in Greece.

Several inclusion criteria were formed as follows: a) permanent residents in Attica, b) registered in the selected kindergartens, c) speaking and comprehending the Greek language. Preschoolers not attending the extended educational program (from 8.15 a.m. to 16 p.m.) were excluded in order to ensure that all participants (preschoolers) would eat lunch during school hours. The total number of participants consisted of five hundred and seventy-eight (n=578) preschoolers, five hundred and seventy-eight (n=578) guardian parents, both native Greeks (n=451) and other nationalities (n=127) from 63 public Kindergarten schools in 36 municipalities within Attica region. Schools were situated both at the suburbs and in the center of capital city (Athens) and were randomly selected from a list provided by the Ministry of Education.

Additional information on study design and sampling is presented in another paper which is currently under publication.

Ethical approval

The study was designed according to the principles of Helsinki declaration (1989) and approved by the Research Department of the Education Institute of the Hellenic Ministry of Education (ethical approval F15/1774/222145/2016). Participants (guardian parents) and kindergartens were extensively informed for the purposes and processes of this study and provided written consent forms and a written approval (a/a: 03/10/2016), respectively.

Anthropometrical & Lifestyle Measurements

Data regarding families' demographic characteristics and profile, such as parent's age, ethnic group, employment status and years of education were collected by the use of the validated Food Frequency Questionnaire (FFQ).[184]Additional anthropometrical data were obtained by preschoolers' parents, such as current height and body weight of each parent and his/her child. Parents body height (m) and weight (kg) were self-reported and used to calculate parents BMI (kg/m2) and to define parents overweight (BMI 25–29.9 kg/m2) and obesity (BMI P30 kg/m2), according to the World Health Organization classification for adults. BMI as weight (Kg) ratio to squared height (m2) was calculated for each child. To determine overweight and obesity, BMI percentile and CDC were used. BMI between 85 and 95 percentiles, (for age and sex), was accounted as overweight and greater than 95 is defined as obese.

Evaluation of dietary habits

Two separate but similarly structured questionnaires were used in preschoolers and parents respectively. These questionnaires were a composition of two validated tools; the Food Frequency Questionnaire (FFQ)[184] and the Mediterranean Diet Quality Index (KIDMED).[129] The KIDMED score[46] measured adherence to the Mediterranean style diet among preschoolers, based on the principles sustaining healthful, Mediterranean-style dietary patterns, as well as on those that do not support the Mediterranean-style dietary pattern. Other aspects of eating behavior were also evaluated, such as eating at least one family meal per day, frequency of eating home-delivered food, breakfast consumption, eating while engaged in other sedentary activities.

The FFQ was selected as a validated semi-quantitative food frequency questionnaire designed to assess habitual dietary intake in preschool children.[183] It comprises of 118 food items with the following components: food frequency, type of meals during the day (breakfast, morning snack, lunch, afternoon snack, dinner and evening snack), use of dietary supplements, type of fat used

for cooking, frequency of meals consumed in restaurants or take away and television viewing during meals.

Physical activity assessment

Information on guardian parents' and preschoolers' physical activity levels was obtained by a valid, structured Physical Activity Questionnaire (developed by the Rhea Study, University of Crete).[185] Questions included information on parents' frequency of physical activity (alone or together with their children), type, duration, and intensity of the child's participation in all typical school outdoor organized or non-organized Light to Vigorous Physical Activities (L-VPA).

Statistical analysis

All tests were two-tailed and performed at a=0.05, in the IBM SPSS 24. Upon testing for distributions by Kolmogorov-Smirnov and binomial chi-square, the majority of variables were found to follow a normal distribution. Descriptive statistics were demonstrated using N (%) and Mean (Standard Deviations, SD). Chi-square, Kruskal Wallis and Mann Whitney tests were utilized.

Furthermore, two new variables were created based on parents' and preschoolers' dietary habits, using empirical grouping of dietary habits questions and checking the final grouping by cluster analysis. Lastly, mathematical weights were provided to rank least and best patterns of dietary habits per category (parents or children). Pearson's rho was applied to assess the level of concordance and correlation of these two variables. Two multivariate regression models were developed to predict preschooler's BMI and low KIDMED score based on preschoolers and parent's habits.

RESULTS

Level of concordance of parent's and child's dietary habits

Figure 1 illustrates the level of concordance of parent's and child's dietary habits utilizing the overall diet score in each group. As observed, dietary patterns presented significant correlation (Pearson's rho= 0.94, p <0.001). More than 90% of child's dietary habits could be explained by parent's choices (R2=0.91). Detailed findings on parent's and child's dietary and lifestyle habits per nationality group are presented in Table 1 and Supplementary Tables S1 and S2.

Predictors of high preschoolers' BMI

Two core multivariate models were developed to estimate high BMI in children. Table 2 presents the first multivariate model of the joint impact of eleven indicators in preschoolers of different nationalities in Greece. Low levels of KIDMED score (β estimate= -0.8, SE=0.2), low levels of physical activity (β estimate= -0.8, SE=0.3), removing fat from meat prior eating (β estimate= -0.6, SE=0.2) and parents' low frequency of following MD (β estimate= -0.5, SE=0.4) seem to increase the risk for high child's BMI, significantly (all $p<0.05$). Moreover, high frequency of watching TV while eating (β estimate= 0.7, SE=0.3), mother's age (β estimate= 0.4, SE=0.03) and BMI (β estimate= 0.6, SE=0.1) also increase the risk, significantly (all $p<0.05$). Similarly, higher risk is observed in children whose parents are long-term smokers (β estimate= 0.2, SE=0.1), (β estimate= 0.3, SE=0.02), alcohol consumers (β estimate= 0.1, SE=0.03) and physically inactive (β estimate= -0.2, SE=0.09) (all $p<0.05$).

In the second multivariate model (Table 3), several indicators were identified as significant ($p<0.05$). Similarly to the first model, the following parents' characteristics were found to increase BMI risk: high BMI and years of smoking, decreased physical activity, low frequency of following the Mediterranean nutritional scheme and removing fat from meat prior eating. In addition to these factors, the latest the time of dinner consumption (β estimate= 0.8, SE=0.2) and the highest the number of meals consumed at fast food restaurants (β estimate= 0.7, SE=0.1), the greatest is the risk for high BMI in children. On the contrary, consumption of breakfast (β estimate= -0.9, SE=0.1) and brunch (β estimate= -0.8, SE=0.1), high frequency of consuming vegetables or fruits (β estimate= -0.6, SE=0.02) and physically active parents (β estimate= -0.5, SE=0.1) seemed to diminish the risk for high BMI in children. Lower risk was also presented when parents control child's diet (β estimate= -0.6, SE=0.4).

Predictors of preschooler's KIDMED score

Table 4 summarizes the joint effect of low KIDMED score predictors, adjusting for child's age, BMI and nationality. Child's increased physical activity (β estimate= -0.6, SE=0.3) and parents' frequency of following the Mediterranean Diet (β estimate= -0.9, SE=0.03) were observed to decrease the risk for low KIDMED score, while watching TV when eating, increased children's risk of low KIDMED score (β estimate= 0.5, SE=0.08). Similar trends were observed to preschoolers whose parents have a high BMI (β estimate= 0.7, SE=0.01) and are long-term smokers (β estimate= 0.5, SE=0.4). All $p<0.05$.

DISCUSSION

Our study revealed that low levels of parental PA and frequency of following MD, eating out in fast food restaurants, mother's age and child's BMI operate as predictors of high preschoolers' BMI. To the contrary, breakfast, brunch and early dinner consumption, vegetables and fruits intake, removing fat prior eating, parental control of preschoolers' diet have a positive effect on maintaining preschoolers' normal BMI or decreasing obesity/overweight . Additionally, parents and preschoolers frequently following MD, child's increased physical activity were depicted as predictors of positive preschoolers' KIDMED score, whereas, reverse outcome was found with parents with high BMI. Watching TV while eating, parental smoking and alcohol consumption, were found to be predictors negatively associated with preschoolers' BMI and KIDMED score. Lastly, ethnicity seemed to play an integral role on lifestyle trends, yet it had no diverse impact on the under study outcomes (e.g. child's BMI and adherence to the Mediterranean diet).

Parental characteristics and habits as predictors of high preschoolers' BMI

Considerable evidence supports the fundamental role parents play in shaping the development of child eating habits, behaviors[197] and their weight status.[198] The current study revealed significantly similar dietary habits between parents and preschoolers. These findings presented trends based on a generalized pattern of their habits, concluding on the high impact of parental choices on children.

Low levels of parental physical activity and adherence to the Mediterranean diet

Studies examining the associations between PA and body fat in young children are scarce,[73,211] and to the best of our knowledge, few studies have estimated the associations between objectively measured PA and BMI in preschoolers.[99,212] Our study addressed, as well, the strong relationship between high levels of parental physical activity and children's active engagement in physical activities, with the positive, beneficial effect of their lower BMI, a pattern also observed in other studies on preschoolers.[213-214] Concerning the relationship of the MD with young children's BMI, although the relevant epidemiological studies do not always show the same protective effect, it could be claimed that higher adherence to the MD reduces the risk for children's OW/OB. [125]

High frequency of watching TV while eating

The significant correlation between time spent on TV watching and BMI has been repeatedly shown since the eighties [215-217]suggesting that increased levels of children's TV viewing increase

the overweight epidemic among children.[1,59]Similarly to our study, the GENESIS study[218] found that children's BMI status, physical activity status, their maternal educational status and the region of residence were significantly associated with the time children spent in TV viewing.

Mother's age and child's BMI

Our study evidenced that mother's age and BMI significantly increase the risk of high BMI in preschoolers, which is consistent with previous studies in preschoolers, also revealing a higher prevalence of OW/OB in children with overweight/obese parents compared to their peers' parents with normal weight.[10,220,221]Similarly, according to the GRECO Study [188] and the Toy Box Study[224]in preschoolers, mother's age was a protective predictor for both girls' and boys' OW/OB status.

Parental smoking and alcohol consumption

Our study depicted the increased risk for high BMI in preschoolers whose parents are long-term smokers and alcohol consumers. In line with previous research, higher maternal alcohol consumption during pregnancy is associated with a slightly lower likelihood of 14-month-old infants following a relatively healthy dietary pattern.[185] Maternal smoking during pregnancy or early infancy and paternal smoking during the prenatal period are predominantly associated with infants or children up to age 7 years following unhealthier diets and/or being less likely to adhere to healthier diets [185].

Eating out in fast food restaurants

Eating outside home has been associated with higher intake of dietary fat and energy compared to home eating, and as frequency of eating at fast-food restaurants has increased, consumption of fruit, vegetables, and dairy has decreased.[225] Our research study, also pointed out that the risk of obesity and high BMI score in children is elevated the more often they eat outside home, in fast food restaurants.

Parental characteristics and habits decreasing risk of high BMI in preschoolers.

Breakfast consumption as determinant of young children's BMI

Promoting breakfast eating among children is multi-beneficial, including improved cognitive and physical abilities, increased likelihood of meeting the recommendations for fruit and vegetable intake, and decreased unhealthy snacking.[99]Our finding echoes those of the Greek PANACEA Study in 10-12-year-old Greek children,[226] in which daily consumption of breakfast was also inversely associated with prevalence of OW/OB in both genders.[227]

Brunch and early dinner and their relation to preschoolers' BMI

Parental dynamics strongly influence the incidence and regularity of family meals having a protective effect in young children's BMI.[108-235] Regular family meals are related with a lower risk of OW/OB, higher average of fruit and vegetable intake, lower fast food and soft drink consumption and an overall better diet quality.[230] Our research demonstrated that brunch consumption and the latest time of dinner consumption is inversely associated with high BMI and occurrence of OW/OB in preschoolers, regardless of gender and ethnic background. According to a relevant review,[230] significant associations between higher family meal frequency and better overall diet quality, less unhealthy diet and lower BMI were revealed.

Parental control of preschoolers' diet as determinant of BMI

Associations between parental structural strategies and child's lower BMI score and promotion of healthy eating are more frequently adopted at preschool age, while they seem to be of less value at older child ages probably due to the degree of child's independence.[236] Existing literature with low-income minority samples suggests that certain parental feeding practices, such as an indulgent feeding style, were associated with child overweight.[237] A cross-sectional study of ethnically diverse, low-income preschoolers and their mothers [238] exhibited that neither child race nor maternal pressure to eat and restriction were linked to child overweight based on child BMI.

Predictors associated with preschoolers' KIDMED score

Parental and children's frequency of following the Mediterranean diet are depicted, in our study, as positive predictors of preschoolers' higher KIDMED score. Similarly, the Greek Childhood Obesity (GRECO) study showed that children with higher KIDMED score presented more frequent consumption of foods sustaining the MD pattern (fruits, vegetables, legumes, dairy products, fish, bread, nuts) and a less frequent consumption of foods that undermine the MD scheme, and should be consumed in moderation or rarely.[148] Moreover, breakfast consumption, the habit of having family meals during the week, and higher adherence of parents to the MD increased the odds of a child presenting higher KIDMED score.[148] The adverse association between low adherence to the MD dietary patterns and a non-optimal KIDMED score was similarly addressed in another study of Greek children,[143,239] as well as Cypriot children.[240]

Study limitations

The current findings should be discussed under some limitations and be carefully translated into further research and actions. Power analysis was not conducted since we addressed all active kindergartens and managed to have satisfying response rates. This may led to underestimation of preschoolers BMI and should be taken into consideration. Additionally, no clinical and somatometric measurements were performed, since all data were self-reported; potentially hiding slight information or/and recall bias.

CONCLUSIONS

Parents, as nutritional gatekeepers, influence and shape, especially in the early years, their child's eating behavior both directly, through the food they prepare and consuming at home, and indirectly, through their behavior, attitudes and the nutritional environments they choose for their children inside, or outside home. The present findings could represent a stepping stone for the formulation of nominal early life obesity curbing family, as well as school-based interventions and public health policies in Greece.

Declarations

Authors' contributions

MC conceptualized and designed the study, formulated the research questions, carried out the study, drafted the article and revised it critically for important intellectual content and final approved the final version to be submitted. IT formulated the research questions, analyzed the data, drafted the article, revised it critically for important intellectual content and approved the final version to be submitted. DSP analyzed the data, drafted the article, revised it critically for important intellectual content and approved the submission of the final version. NT formulated the research questions, designed the study, reviewed the manuscript and approved the final version to be submitted.

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Declaration of interest

The authors declare no conflict of interest related to this publication.

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APPENDIX 7: SUBMITTED ARTICLE 1

Family's lifestyle impact on Greek and different nationality preschoolers' dietary habits and BMI during the austerity periodin Attica, Greece.

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Abbreviations: BMI, Body Mass Index; FFQ, Food Frequency Questionnaire; MD,Mediterranean Diet; TV, Television; PA, Physical Activity

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Abstract

Greek financial crisis has altered everyday living conditions, with significant health effects both in native and ethnic diverse population. We hypothesized that family's lifestyle would be correlated withpreschoolers' BMI & KIDMED score in any ethnic group. Thus, the current cross-sectional study, performed in Attica region, Greece, aimed to assess Greek and immigrant preschoolers and their families regarding body mass index (BMI), nutritional habits and adherence to the Mediterranean diet, during the Greek austerity period. A total sample of 578 guardian parents and 578 preschoolers were studied in 63 kindergartens in 36 municipalities in Attica.No significant differences were observed in BMI rates between Greeks and non-indigenous guardian parents (normal/overweight) and preschoolers (normal weight), significant,however, weight gains (approximately 12 kg) inimmigrant parents upon permanent stay in Greece were reported. Statistically significant variations in lifestyle habits including Greek parents'heavier smoking and other ethnicity guardian parents' higher physical activity weredepicted. Poor levels of adherence to the Mediterranean diet were observed in all preschoolers, while factors positively associated with child's BMI were: guardian parent's age and BMI (Pearson r= 0.78 and 0.96 respectively) ($p<0.001$), guardian parent's smoking status ($r=0.81$, $p=0.02$) and alcohol consumption ($r=0.79$, $p=0.03$). Guardian parent's, child's physical activity and child's KIDMED score were protective factors ($r=-0.72$, -0.96, -0.83 respectively), all $p<0.05$. In conclusion, family's lifestyle seems to strongly impact on preschoolers' dietary habits and BMI, regardless ethnicity. Therefore, determination of preschoolers' and family's dietary patterns could be a reliable indicator for monitoring overweight/obesity epidemics at early ages.

Keywords: Body Mass Index; Obesity; Lifestyle; Preschoolers; Immigrants; Mediterranean Diet.

1. Introduction

Childhood overweight and obesity is a growing public health problem worldwide, especially in countries undergoing severe financial and/or social reforms; including Greece [6,7]. This alarming health issue is considered to be a major risk factor for several chronic diseases in child's later life, and should be further explored even in younger age groups[8]. Greek studies from 2007 to 2015 focusing on preschoolers report high percentage (21.2-23.2%) of overweight (including obesity) [9-12].

Dietary habits, nationality, cultural profile, socioeconomic status and physicalactivity, as well as familial and guardian parent's Body Mass Index (BMI) and lifestyle are some of the frequently documented health related determinants of childhood obesity/overweight [8,13]. Particularly, increased immigration, lower socio-economic status, changes in food type, overconsumption of high fat and protein goods, pre-prepared and fast foods, low intake of fiber and increased intake of sugar and sweetened drinks, as well as a decline in physical activity, with high exposure on screen-based and sedentary leisure activities (e.g. internet and video games) outline the main changes of modern multicultural world; leading to obesity and overweight even in under 5 years old children[1].Towards this direction, family's nutritional pattern, lifestyle choices and cultural particularities seem to determine child's behaviors, BMI and overall health assets[14]. These trends are even more evident in European countries with limited resources [9,10,15,16].

Nevertheless, there is a paucity of long-term epidemiological data regarding obesity status in early aged children (i.e. preschoolers) worldwide and mainly in European and Mediterranean countries undergoing societal and/or financial challenges [17]. Since 2009, Greece is one of the most representative countries having being affected by the social and financial crisis in Europe and has already reported significant adverse effects in public health [18]. Even among preschoolers obesity and lifestyle pattern seems to have changed [1]. To the best of our knowledge, the only Greek evidence is reported in the Genesis study that has revealed excess body weight in preschoolers (overweight prevalence =17.2%) [9]. Overweight prevalence in young children has increased even more during the austerity period in Greece (18.2%), while obesity reached the 7.4% [19]. Still, variations and differences among the different ethnicity or

cultural groups in preschoolers have not been sufficiently reported in the Greek literature, although it is a country with many immigrants [8,20].

Contrary to that, the vast majority of European research on obesity and overweight in children is currently drawing attention to cultural comparison studies, exploring differences and similarities in food preferences, nutritional habits and health outcomes between children from ethnic minority groups; coming from the former Eastern Bloc countries, from Asia, India, Pakistan, Bangladesh and Africa [21,22].

Despite their socioeconomic disadvantages and healthcare accessibility barriers, those maintaining a satisfying overall health status are able to travel and reach host countries[23,24]. This is known as the "migrant paradox" phenomenon[25]. Nevertheless, upon permanent and long-term stay, intrinsic and environmental factors cause unhealthy weight gain, often beyond the levels seen in native populations[26]. Immigrant's dietary habits seemed to approach some of the principles of the so called "Mediterranean diet-like pattern", for which has been extensively highlighted that greater adherence is associated with significantly improved health status and lower risk of metabolic syndrome and chronic diseases [7,27].

Preschoolers and their families are an understudied age group, especially after the onset of the financial crisis that has inserted a vast number of adverse health effects both in the native and non-indigenous population in Greece[49,50]. Available literature on BMI and dietary intakes mainly focuses on young children over 6 years old and adolescents, with only scarce relevant data on Greek and ethnic minorities' preschoolers in Greece [8,51,52].Still, it is worth mentioning the research findings ofa recent (2015) Greek studyperformed in West Attica during 2009-2012, the years of Greek economic crisis, according to which a statistically significant reduction in overweight and obesity in children from 6 to 16 years old was noticed during the initial years of the Greek financial crisis [45],probablyas a consequence of the rising proportion of Greek households that have been unable to afford the provision of meat, chicken or fish every second day to their children after the onset of the financial crisis and reformsplaguing Greece [18].

The current study attempted to fill the literature gap by assessing native Greek and immigrant preschoolers' and their family's obesity and nutritional habits during the Greek austerity period, initiating on 2009. Primary objective was to identify potential differences

in BMI between native Greek preschoolers and those of other ethnicity. Additional objectives were to explore further variations between native and non-indigenous families including the evaluation of guardian parents' BMI and lifestyle characteristics such as smoking, alcohol consumption and physical activity, preschoolers' adherence to the Mediterranean diet-like pattern and the exploration of family and/or individual indicators associated with preschoolers' increased BMI.

This paper summarizes primary results of our study and discusses findings under the light of the literature in order to guide health professionals in developing more effective interventions for the prevention of childhood obesity in Greece and other countries of similar socio-demographic profile.

2. Methods and materials

2.1.Study design and population

This cross-sectional study was designed and carried out according to the principles of Helsinki Declaration(1989) and approved by the Research Department of the EducationInstitute of the Hellenic Ministry of Education (approval F15/1774/222145/2016). It was conducted in Attica region (largest administrative region in Greece, including the capital city), during the school year 2016-2017. The study population consisted of preschoolers aged 5 to 6 years and their family (i.e. guardian parent), attending kindergarten located in the region of Attica(including the capital city of Athens).

For the aims of this study we adopted the definition of an ethnic group or population as "a group of people smaller in number than the majority categories, who by their customs, language, race, values, and group interests differ from the majority population" [38]. The framework of ethnicity in our study, similarly to other cross-sectional studies [182], was defined according to the country of birth of the preschoolers as well as that of their guardian parents. Specifically, a participant was considered of non-Greek ethnicity if either of the following criteria was fulfilled: (1) born outside Greece and at least one parent born outside

Greece (i.e., first generation); or (2) born in Greece, but both parents born outside Greece (i.e., second generation) and migrated in Greece.

Several inclusion criteria were formed as follows: a) Permanent residents in Attica (at least the last 2 years, irrespective of ethnicity), b) Registered in the selected kindergartens, b) speaking and comprehending the Greek language regardless ethnicity). Preschoolers not attending the extended educational program (from 8.15 a.m. to 16 p.m.) were excluded in order to ensure that all participants (preschoolers) would eat lunch during school hours.

A geographically representative sample of kindergartens was achieved upon a kind invitation of all active facilities in the study region (Figure 1). A total of 63kindergartenslocated in 36 municipalitieswithin the Attica region, situated both at the suburbs and in the center of capital city (Athens), were randomly selected from a list provided by the Hellenic Ministry of Education. Furthermore, five hundred and seventy-eight (n=578) guardian parents of preschool children, both native Greeks (n=451) and other nationalities (n=127) -attending the enrolled kindergartens- were included in the study. Families of other nationalities originated from: Egypt (n=1), Ethiopia (n=1), Albania (n=79), Bulgaria (n=2), Georgia (n=3), Indonesia (n=1), Jordan (n=1), Kazakhstan (n=3), Canada (n=1), Morocco (n=1), Moldova (n=2), Nigeria (n=2), Hungary (n=1), Uzbekistan (n=1), Ukraine (n=2), Poland (n=7), Romania (n=9), Russia (n=3), Sudan (n=1) and Syria (n=1).

2.2.Processes and tools

Three separate but similarly structured questionnaires were used in preschoolers and guardian parents respectively. These questionnaireswere a composition of four already validated tools; The ‘Rhea follow-up FFQ’ [183], which is a validated semi-quantitative food frequency questionnaire designed to assess habitual dietary intake in preschoolers, the Food Frequency Questionnaire (FFQ) (frequently tested and utilized in Greek settings) [184], the Physical Activity Questionnaire in preschoolers (developed by Rhea study and tested in Greek settings) [185], while theMediterranean Diet Quality Index (KIDMED)[129] was also incorporated in the final questionnaire to measure adherence to the Mediterranean style diet among preschoolers: the principles eithersustaining healthful, Mediterranean-style dietary patterns (e.g. daily consumption of fruit and vegetable, weekly fish and legumes intake), or opposing to the

Mediterranean-style dietary pattern (e.g. intake of fast food, increased consumption of sweets) [129]. The total KIDMED score ranges from - 4 to 12 and is classified into three levels: ≥ 8, suggesting an optimal adherence to the MD; 4-7, suggesting an average adherence to the MD and an improvement needed to adjust dietary intake to guidelines; and ≤ 3, suggesting a low adherence to the MD and generally a low diet quality.

Overall, four (4) main sections composed the final version of these tools, with information on: family's sociodemographic profile (gender, age, place of residence, duration of living in Greece, parental educational level and profession), guardian parent's weight, height, lifestyle habits (including smoking, alcohol consumption, physical activity), family's nutritional habits and cooking choices, preschooler's weight, height, nutritional habits all day long at home and during kindergarten, adherence to the Mediterranean diet, physical activity and television (TV) watching.

The questionnaires were distributed and filled in by the guardian parents during kindergarten hours. All kindergartens were extensively informed for the purposes and processes of this study and provided written approval (a/a: 03/10/2016). A well trained researcher from the authorship was responsible for the coordination and performance of this survey, while collaboration of the kindergarten's directors was substantial for the contact with the parents. All guardian parents were also informed and provided consent forms before the initiation of the survey.

2.3.Statistical analysis

Analysis was conducted in the IBM SPSS 24.0., while all tests were two-tailed and performed with statistical significance set at a p=0.05. Distributions of all variables were tested by Kolmogorov-Smirnov and binomial chi-square; indicating a normal distribution in most cases. Descriptive statistics were exported and demonstrated using N (%) for categorical variables and Mean (Standard Deviations, SD) for scale variables. Furthermore, chi-square, Mann-Whitney and Student's t tests were performed to identify potential differences between native Greeks and ethnicity minority groups (no additional statistics per minority ethnicity group are presented due to small number of cases in the sub-groups). Additionally, the correlation

coefficient was estimated using Pearson r, in order to assess association between preschoolers' BMI and selected child's and guardian parents' indicators. Furthermore, classification of BMI, calculated as the weight over the squared height(kg/m2), was attempted (i.e. underweight, normal, at risk of underweight, overweight, obese) [186]. Nevertheless, no statistical comparisons were possible due to the fact that all preschoolers were found to have normal BMI. Lastly, it should be noted that the variable "physical activity" was computed based on frequency of TV watching, indoor and outdoor playing activities using the weighted mean formula.

3. Results

Participants' demographic profile is presented in Table 1. Gender and age of the participating families were almost similar between Greeks and those of other nationalities, reflecting the homogeneous demographic background. The vast majority of the participants guardian parents were females (mothers) (Greeks: 81.2% and other nationalities: 77.1%) with mean age 38.2 and 35.1, respectively. Similarly, mean number of children attending kindergarten was 1.4, regardless nationality. Lastly, this child often was the fifth in order within the family. However, place of residence, educational level and profession varied significantly (pvalue<0.001) between Greek and other nationalities. The majority of Greeks were residing in West Attica (32.2%), whereas those of other nationalities were in the center of Athens (52.5%).

Table 2 presents other characteristics of the participating guardian parents compared between nationalities (Greeks versus other nationality). Obesity characteristics didn't vary, since mean BMI was 24.9 (13.2) in Greeks and 24.8 (4.5) in other nationalities(between limits of normal and overweight). It should also be noted that 72.1% of the "other nationalities" stated that gained weight upon stay in Greece (approximately 12 kg), mainly due to pregnancy or other reasons related to low physical activity, disease and anxiety. Furthermore, approximately 35% of both participating groups were smokers, with Greeks presenting significantly (pvalue=0.03) longer smoking activity (16.1 years) comparing to other nationalities (12.2 years). Additional variations were observed in physical activity (pvalue=0.004), with the majority of other nationalities' parents being active (71.7%), while Greek parents being inactive (42.5%).

Focusing on preschoolers' obesity and dietary differences between the two nationality groups (Table 3), children's BMI didn't vary since it was 15.7 and 15.8 (normal/healthy weight) in Greeks and those of other nationalities, respectively. Similarly, KIDMED score was "poor" in the majority of both groups (Greeks: 85.8%, other nationalities: 87.4%, pvalue=0.7). Nevertheless, several differences were observed in the sub-categories of KIDMED score measuring Mediterranean diet habits. In particular, more children of other nationalities consume fish regularly (p value=0.04) and visit more than once per week a food restaurant, comparing to Greek children (pvalue<0.001). Furthermore, the 70.9% of the children of other nationality consumes pasta or rice almost every day (Greek: 56.2%, pvalue<0.001), the 80.2% of them have cereals or grains for breakfast (Greek: 69.8%, pvalue=0.02). Significantly less (pvalue<0.001) Greek children skip breakfast (10.9%) comparing to other nationalities (29.4%), whereas more Greeks use olive oil at home (Greek: 99.6%, other nationalities: 94.5%, pvalue<0.001). In addition, the 18.4% of other nationalities chooses commercially baked goods or pastries for breakfast (Greek: 9.1%, pvalue=0.003) and the 37% takes two yoghurts and/or 40g cheese daily (Greek: 50.2%, pvalue=0.008).

Table 4 depicts the main strongest correlations between child's BMI and several individual or family indicators. Guardian parent's age and BMI are positively correlated (pvalue<0.001) with child's BMI (0.78 and 0.96 respectively), whileguardian parent's lifestyle seems to have a strong impact on child's BMI, since the less a parent smokes and consumes alcohol, the more normal child's BMI tends to be. Conversely, guardian parent's and child's physical activity are inversely correlated with child's BMI (-0.72, pvalue=0.03 and -0.96, pvalue=0.04 respectively). Lastly, child's high BMI was revealed to be strongly correlated to low KIDMED score (-0.83, p value=0.01).

4. Discussion

The current study, performed during the recent challenging period of the financial and refugee crisis in Greece, attempted to minimize the vacuum in the current knowledge on dietary and lifestyle patterns in under 5 years old children of different ethnic background;by setting light in the exploring and assessing potential differences and similarities concerning body mass index (BMI), nutritional habits, as well as adherence to the Mediterranean diet

between Greek and preschoolers of different ethnicity. Among the key findings of the study, were the following: a) similar BMI rates between Greeks and ethnic minority groups, both for the guardian parents (normal/overweight) and the preschoolers (normal weight), b) significant weight gain of immigrant parents upon permanent stay in Greece, c) significant variations in several lifestyle habits including heavier smoking by Greek parents, higher physical activity in non-Greek parents of different ethnic origin, d) poor KIDMED score in both ethnicity groups, yet slight differences were observed in some of the Mediterranean dietary habits and patterns, e) strong correlation between child's BMI and KIDMED score, as well as with guardian parent's age, BMI, and overall lifestyle.

4.1.Discussion under the light of the literature

4.1.1. Sociodemographic differences between native and non-indigenous preschoolers

Socio-demographic parameters play an integral role in forming lifestyle and health behaviors[188], while immigrants are more vulnerable to social and economic disadvantage, usually having low income, poor housing conditions and higher unemployment rates than the native population of a country[189-191]. Focusing on the Greek multicultural reality, a recent study performed in Greece during the austerity period[192], revealed that a relatively small proportion (56.5%) of immigrant families -compared to the natives- had health insurance coverage due to their being unemployed, informally employed, even undocumented. These results echo those found in our study, which also revealed sociodemographic inequalities between native Greeks and preschoolers' families from other nationalities, regarding place of residence, educational level and profession.Deepening the results of our study, both population groups, indigenous (Greek) and other nationalities guardian parents, inevitably experienced unemployment, as a consequence of the Greek economic crisis, with immigrant parents, mainly women, exhibiting significantly higher unemployment rates, fact that is interconnected to their place of residence, in the center of Athens.

4.1.2. Compliance with the Mediterranean dietary habits (KIDMED score) and BMI between native and non-indigenous preschoolers

Unhealthier and/or poorer diets according to the Mediterranean Diet Score[129]were associated in the literature with lower maternal educational level and parental unemployment[46]. Over the last years a decline in adherence to the Mediterranean dietary pattern has been observed[199], and a parallel gradual shifting away from traditional dietary habits towards more "Westernized" dietary choices, involving fast-foods, processed foods, sugary beverages and lower consumption of local traditional foods, as a result of cultural and economic progress. Such dietary pattern and preferences changes can be attributed to a higher availability of unhealthy foods due to the globalization of the markets[200,201],but can also be explained as an outcome of an economical issue, since healthier foods cost more than unhealthy and/or as an educational issue, as lower educated individuals may not have access to adequate information regarding health matters[202]. Similar trends were also reported in the current study, with ethnicity minority groups presenting slight divergence from the Mediterranean dietary pattern, yet with no negative impact on BMI. These minor variations could probably be a result of the overall impact of the financial crisis on the socio-economic status of all families regardless ethnicity[49].The wider availability of foods and the improvement of living standards, along with the influence of the host country dietary habits, which are closer to the Mediterranean diettraditional pattern could often affect immigrants' living standards and dietary habits [58].Towards this direction, non-indigenous families participating in our study presented satisfying levels of adherence to the Mediterranean diet, while they stated gaining weight upon permanent stay in Greece,mainly due to pregnancy or other reasons related to low physical activity, disease and anxiety.

4.1.3. Adherence to Mediterranean diet and BMI

According to a Greek study in 6-12 years old children [207] skipping breakfast,lack of fruits and vegetables consumption, and consumption of bread and soft drinks, were nutritional habits positively associated with obesity, while lower rates of obesity were attributed to children's healthy nutrition in school.Physical activity, at the same time, was inversely correlated with high BMI[207]. Some evidence in national studies from Mediterranean countries, such as Portugal, Spain, and Greece confirm a frequent intake of healthy food (e.g. fruit and vegetables) despite the high prevalence of overweight/obesity in early ages, attributed to

extra energy intake from sugared beverages and snacks and higher than recommended protein intake, especially from dairy products[46].These observations seem to be slightly present in our study, particularly among the ethnic minority groups. More specifically, ethnicminority groupsin our study tended to consume fish more often than their native peers, but also consumed pasta or rice almost every day, they had commercially baked goods or pastries for breakfast and often skipped it. Breakfast skipping seems to be a growing scourge connected in the literature to an unhealthy dietary children's status leading to obesity risk and high BMI [208,209], depicted in higher percentages in immigrant children populations [191]. Although Greek preschoolers are also skipping breakfast [210], immigrant preschoolers -in our study- were significantly (twice the rate) more breakfast skippers comparing to their native peers.On the other hand, our study revealed that more native Greek preschoolers consumed olive oil at home and yoghurts and/or cheese daily, while they rarely visited restaurants / fast foods and used less commercial goods that are higher than recommended in protein and sugar.

4.1.4. Guardian parent's obesity and lifestyle factors as determinants of preschoolers' dietary behavior and weight

A plethora of studies have indicated the direct connectionofchildren'shealthy way of living with family's adequate foodconsumption, physical activity, parents' limited alcohol intake and avoidance of smoking[193]. As prementioned above, low income has been, generally, associated with atendency to unhealthy dietary habits, lower physical activity, alcohol consumption, heavier smoking andhigher risk of chronic diseases[58,66,194].Furthermore, many studies have reported on the role of family's lifestyle and BMI on preschoolers' health behavior and overweight[190,195]. Due to the fact that the majority of guardian parents of our research sample were females (mothers), we assume that there is strong correlation among the degree mothers' age, dietary and lifestyle pattern determine children's BMI. Our study findings, stressing guardian parents' age, obesity or overweight as well as smoking habits, alcohol consumption and physical inactivity, as clear indirect determinants of child's BMI and nutritional habits, come in compliance with relevant studies [66,195].

Although there are some limited existing research data on Greek preschoolers' PA profile, according to which they fail to meet the recommendations of PA for that age [64,67,196], with immigrant preschoolers being in a more aggravated position [191], to the best of our knowledge, there is no data on guardian parents', Greek and from other nationalities, PA levels. Therefore, we consider our finding that immigrant guardian parents are more physically active than Greeks to be of major significance.

5. Study strengths and limitations

To the best of our knowledge, this was the first study on dietary and lifestyle habits of preschoolers of different ethnicity residing in Attica, the largest administrative region in Greece. At the same time, it measured the same outcomes in both preschoolers and their guardian parent, attempting to comprehend the impact of familial habits on child's BMI. The design and the selected already validated instruments used, were among the major strengths empowering study's findings. Furthermore, the continuous monitoring of the survey processes and the satisfying geographical coverage of the kindergartens have added value to our key findings that comply with most studies in the literature as well as with our observations and experience in the Greek setting.

However, results should be discussed under the light of several limitations, including the un-clustered sampling and the small number of participants per non-indigenous ethnicity group. For instance, families from Albania were much more numerous than those from other countries, such as Sudan and Syria, constituting any cross-correlations impossible. Although we didn't perform a power analysis inserting a potential limitation to the generalizability of our observations, we strongly believe that any overestimations or underestimations of the outcomes are limited and may not affect final conclusions. This is due to the fact that participants were representing the majority of kindergartens and a respected percentage of preschoolers per kindergarten. Lastly, significant findings were discussed in this paper, nevertheless no casual associations exist between the observed trends due to the nature of this cross-sectional study.

6. Key messages and implications of the study

The current study conveyed new knowledge on BMI prevalence in preschoolers and their families, controlling for the role of ethnicity and other behavioral and lifestyle factors of both groups (children and guardian parent), during the Greek financial crisis. It was evident that although BMI was almost identical between the ethnicity groups, several variations in the lifestyle, dietary and physical activity patterns were observed and could strongly affect their later life in adolescence and adulthood. Education and familial socioeconomic status could be considered core indicators associated with healthier quality diets and should be the main target in future interventions towards a healthier lifestyle. Therefore, future studies should focus on the exact nutritional habits of parents and children in home and school, explicit physical activities, lifestyle beliefs and attitudes as well as cultural and spiritual beliefs. Family's lifestyle seem to have the strongest impact on preschoolers' dietary habits and BMI, regardless their ethnicity. In conclusion, family oriented interventions should become the cornerstone of public health planning in low resource countries in Europe and the Mediterranean region. Socio-economic characteristics jointly with food intake and physical activity patterns have to be considered within the spectrum of individual and family particularities and special needs.

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APPENDIX 8: UNDER REVIEW ARTICLE 2

Assessing the impact of vigorous physical activity and sedentary behavior on preschoolers' body mass index; the role of ethnicity

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Running Head: Physical activity in preschoolers

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Assessing the impact of vigorous physical activity and sedentary behavior on preschoolers' body mass index; the role of ethnicity

Abstract

Overweight/obesity prevalence in children has been constantly increasing in many countries of the Mediterranean region, including Greece, especially during challenging periods of intense immigration, financial and social recessions. The current study attempted to assess physical activity and explore associations with BMI in preschoolers of different ethnicity, residing in Attica, Greece. A cross-sectional study was performed, enrolling 578 preschoolers and 578 guardian parents, both native Greeks (n=451) and other nationalities (n=127). Current levels of vigorous physical activity (outdoor play, sports participation, active transport to/from school) or sedentary behaviors (television viewing, video/DVD and computer game use) among native and immigrant preschoolers in Attica region were described and found to vary partially between Greek and other ethnic groups ($p<0,05$). Frequency of physical activity was inversely correlated to body mass index, indicating that the less they exercise the more body mass index

rises in both ethnic groups (Pearson's r, p; -0.97, 0,04 in Greeks and -0.81, 0,04 in other ethnicities). Physical activity was found to be an independent indicator of increased body mass index (β estimate= -0.8, p=0.02), but some particular habits tended to increase risk of high body mass index in preschoolers (p<0,05: TV watching daily and in weekends, mother's time spending in watching TV or using the computer and parent's attempting to provide food even when the child is not hungry). Observed burden, associations and identified risk factors could support additional research hypothesis generation and first-level intervention programs in Greece and other countries of similar socio-demographic profile.

Keywords: physical activity, body mass index, nutritional habits, immigrants, ethnicity

Introduction

Physical activity (PA) and nutritional habits are amongst the core health behaviors that are silhouetted during preschool years, while they tend to affect several core obesity indicators; including body mass index (BMI) [36]. The 2011 World's Health Organization (WHO) estimation [47], highlighted that more than 42 million preschoolers are overweight, with most of them having low PA and high sedentary behavior [12,48]. Therefore, it is evident that this age group deserves prompt attention and monitoring these children prospectively to capture childhood and adult life health and clinical outcomes.

Greece is among the developed countries with constantly increasing overweight and obesity rates, with mean prevalence in Greek preschoolers being approximately 23% [10,28]. Furthermore, other international studies have already recognized importance of this fact and have reported low levels of PA during school hours, high levels of sedentary time [29,30]and the potential devastating effects on child's health and development [31,32]. Apart from body fat-related impact, PA contributes to other aspects of health, such as bone and skeletal health, cardiometabolic health, motor skill development, cognitive development and psychosocial health [33,34].

Although PA trends to vary between preschoolers of diverse ethnic groups [8,35], little is currently known [35]. Ethnic differences in prevalence of childhood and preschool overweight/obesity, BMI and PA have been extensively investigated in the USA, while European studies on this topic are

scarce [36,37]. Further evidence on these trends and associations is essential, especially in countries of the Mediterranean region, that have increased rates of immigrants and increased overweight/obesity tendency [38].

The current study attempted to fill this vacuum in the literature by assessing PA status and associations with BMI in preschoolers in Attica region, Greece. Three core research questions were formed as follows; Which are the current levels and potential variations of vigorous PA or sedentary behaviors among native and immigrant preschoolers in Attica region? Are these any associations between BMI and PA indicators? To what extend increases in preschoolers' BMI could be affected by low levels of PA and vice versa?

Materials and Methods

Study design

This current paper reports PA and related associations with BMI, as identified by a larger cross-sectional study assessing overall nutritional and lifestyle habits of preschoolers and their families (i.e. guardian parent). The study was conducted in Attica region (largest administrative region in Greece, including the capital city), during the school year 2016-2017 and included preschoolers of Greek and other ethnicities, aged 5 to 6 years and permanent residents in the study region.

A satisfying geographical coverage of kindergartens was achieved upon invitation of all active facilities in the study region (Figure 1). A total of 63 kindergartens located in 36 municipalities within the Attica region, situated both at the suburbs and in the center of capital city (Athens), were randomly selected from a list provided by the Ministry of Education. Furthermore, five hundred and seventy-eight (n=578) guardian parents of preschool children, both native Greeks (n=451) and other nationalities (n=127) attending the enrolled kindergartens were included in the study.

Inclusion and exclusion criteria

All participants had to meet all inclusion criteria set: a) Permanent residents in Attica (at least the last 2 years, regardless ethnicity), b) Registered in the selected kindergartens, b) speaking and comprehending the Greek language regardless ethnicity. Preschoolers not attending the extended educational program (from 8.15 a.m. to 16 p.m.) were excluded in order to ensure that all participants (preschoolers) would eat lunch during school hours and would have the chance to participate in potential PA activities of the full kindergarten's program.

Ethical issues

The study was designed and carried out according to the principles of Helsinki Declaration (1989) and approved by the Research Department of the Education Institute of the Hellenic Ministry of Education (approval F15/1774/222145/2016). Questionnaires were distributed and filled in by the guardian parents during kindergarten hours. All kindergartens were extensively informed for the purposes and processes of this study and provided written approval (a/a: 03/10/2016).

Tools and measures

The Physical Activity Questionnaire in preschoolers (developed by Rhea study and tested in Greek settings) was utilized to assess PA status [184]. The questionnaire is a reliable tool assessing both vigorous PA and sedentary behavior, along with core related lifestyle behaviors and habits. Additionally, the Food Frequency Questionnaire (FFQ) [186] was also used to assed nutritional habits. It is a validated semi-quantitative food frequency questionnaire designed to assess habitual dietary intake in preschoolers and their families.

The PA and FFQ tools were distributed along with an additional information sheet including information on family's sociodemographic profile (gender, age, place of residence, duration of living in Greece, parental educational level and profession) and preschooler's weight and height. BMI was employed as a representative body fat index and calculated based on the formula; weight / height^2.

Statistical analysis

Analysis was conducted in the IBM SPSS 24.0. All tests were two-tailed and performed with statistical significance set at a=0.05. Distributions of all variables were tested by Kolmogorov-Smirnov and binomial chi-square; indicating a normal distribution in most cases. Descriptive statistics were exported and demonstrated using N (%) for categorical variables and Mean (Standard Deviations, SD) for scale variables. Furthermore, chi-square, Mann-Whitney and Student's t tests were performed to identify potential differences between native Greeks and ethnicity minority groups. Additionally, the correlation coefficient was estimated using Pearson r, in order to assess association between preschoolers' BMI and PA indicators. A linear regression model was developed to assess risk of increased BMI due to PA indicators. The model was adjusted to ethnicity. Lastly, a new variable was computed and is presented under the name "physical activity"; considering all PA questions on frequency of TV watching, indoor and outdoor playing activities using the weighted mean formula.

Results

Participants' profile

The vast majority of the preschoolers' guardian parents were females (mothers) (Greeks: 81.2% and other nationalities: 77.1%) with mean age 38.2 and 35.1 years. Similarly, mean

number of preschooler per family was 1.4 in both ethnic groups. However, place of residence, educational level and profession varied significantly (p value<0.001) between Greek and other nationalities. As expected, the majority of Greeks were residing in West Attica (32.2%), whereas those of other nationalities were in the center of Athens (52.5%). Most Greek guardian parents were working in the public sector (80.1% vs 65% in other ethnicities) and had a high school (44.1% vs 48.8% in other ethnicities) or university degree (35.9% vs 21.1% in other ethnicities).

Current burden in Greek and other ethnic groups

Body mass index and physical activity

Tables 1 and 2 depict all observed variations between ethnicity groups, BMI and PA habits. In most cases although BMI was found to be almost similar (p =0.06) between Greeks (mean=15.7; SD=2.2) and preschoolers of other ethnicity (mean=15.8; SD=3.3), many PA items varied significantly. Preschoolers of other ethnicity tended to watch TV more hours daily comparing to Greek (mean=2.2 vs 1.6 hours/day, p<0.001), and during weekends (mean=3.6 vs 2.7 hours/day in weekend, p <0.001).

Nevertheless, duration of playing basketball in the kindergarten's yard was also found to vary significantly (p=0.03) in favor of those of other ethnicity (mean=20.3 minutes/day vs 14.8 minutes/day in Greeks). Similarly, they played more (p=0.04) both in actively and sedentary position in the kindergarten (mean=59.5 minutes/day vs 48.4 minutes/day in Greeks). The majority of Greek preschoolers, on the other hand, tend to play in the playgrounds (56.7% vs 38.1% in other ethnicities, p<0.001) and have several scheduled afternoon activities (74.1% vs 40.2% in other ethnicities, p<0.001).

Greeks seemed to have more intense PA during summer as well (e.g. swimming, p<0.001) playing at the sand, p=0.02), as well as frequent skating (p=0.02). Still they reported less frequently that they went for calm or intense walk with their parents (88.2% in other ethnicity vs 66.1% in Greeks).

Furthermore, the vast majority of parents of Greek preschoolers reported that spent almost no personal time to facilitate child's physical activity (mothers: 41.4%; fathers: 39.9%). Although slightly lower proportions were reported by the other ethnicities (mothers: 39.2%; fathers: 35.8%) in "almost no time" response, more of them tend to offer at least ½ hour/week (mothers: 11.2%; fathers:17.5%) or 1 hour/week (mothers: 12.8%; fathers: 13.3%) and more than 7 hours/week (mothers: 6.4%; fathers: 6.6%).Additional findings on PA trends per ethnicity group

are presented in Table 1 in the Supplementary materials, since only significant variations were included in Tables 1 and 2 (main manuscript).

Nutritional habits and parent's views on child's current weight:

Table 3 presents guardian parent's responses on child's core nutritional habits and their views on child's current weight. More parents ($p<0.05$) of other ethnicity reported that the child: eats more when is anxious/stressed (7.1% vs 2.9% in Greeks), asks for drinks and refreshments frequently (47.2% vs 30.6%), enjoys tasting new food (32.3% vs 22.6%), if allowed, would eat much more quantities/food (11% vs 7.3%), looks forward to lunch time (22.1% vs 5.3%), even he/she is not hungry parents would try to provide food (37.9% vs 34.3%) and would drink something all day long (37.9% vs 34.3%). On the contrary, more Greek parents reported ($p<0.05$) that the child: has to eat all food in his/her dish (45.6% vs 44.1%) and if parent doesn't control child's diet, the child would eat less than necessary (46.2% vs 41.7%).

Observed associations between physical activity and body mass index

Moreover, several correlations (Pearson's r) were identified between child's BMI and selected PA and behavioral indicators, in Greek and other ethnicity groups (Table 4). Similar medium or strong associations were observed in both ethnic groups, with the statistically significant ones being reported in the table ($p=0.04$). Overall, PA was inversely correlated to BMI (i.e. the less they exercise the more increased BMI), with a correlation coefficient of -0.97 in Greek ethnicity and -0.95 in those of other ethnicity. Parameters that tended to have the strongest proportional correlations with BMI were: TV watching daily and in weekends. Strongest inversely proportional associations were noticed in: physical exercise/participation in music-dance games, playing actively in kindergarten and scheduled afterschool activities. Lastly, mother's time spend in watching TV or using the computer seemed to increase child's BMI (Greek: 0.6, Other ethnicity: 0.7), trying to provide food even when the child is not hungry presented similar trends (Greek: 0.7, Other ethnicity: 0.5).

Risk of high body mass index due to physical activity

Table 5 presents the joint effect of multiple PA indicators in increased risk for high BMI in preschoolers, testing for ethnicity. One independent predictor is also reported in the table; overall physical activity (β estimate= -0.8, $p=0.02$).

Other parameters that increase the risk of high BMI include TV watching daily (β estimate=0.6) and in weekends (β estimate=0.4), mother's time spending in watching TV or using the computer (β estimate=0.5) and parent's attempting to provide food even when the child is not hungry (β estimate=0.7). Inversely, vigorous PA seemed to have a protective role on BMI increases. Such parameters are physical exercising in music-dance games (β estimate= -0.6), active playing in kindergarten (β estimate= -0.7) and participation in additional scheduled afterschool activities (β estimate= -0.6).

Discussion

Main findings

This cross-sectional study shed light on PA and BMI status in preschoolers in Greece, exploring trends and associations in those of Greek or other ethnicity. Three core outcomes were exported as a response to the three research questions set. a) Current levels of vigorous PA or sedentary behaviors among native and immigrant preschoolers in Attica region were described and found to vary partially between Greek and other ethnic groups; b) PA frequency was inversely correlated to BMI, indicating that the less they exercise the more BMI rises in both ethnic groups; c) PA is considered an independent indicator of increased BMI but some particular PA habits tend to increase risk of high BMI in preschoolers (i.e. TV watching daily and in weekends, mother's time spending in watching TV or using the computer and parent's attempting to provide food even when the child is not hungry).

Reflections over the light of the literature

PA and BMI variations between different ethnicities

Adverse lifestyle behaviors such as excessive amounts of TV watching, breakfast skipping, or lack of participation in sports have been shown to be more common among preschoolers from low family socioeconomic status or of ethnic minority groups [59,176]. The current study revealed such variations, especially in PA habits that had to do with afterschool activities. Similarly to our study, sports and vigorous PA were significantly more frequent in native Italian girls (preschoolers) than in immigrant girls [36].Other studies have also demonstrated that native-born

children have greater participation in sports and afterschool PA compared to immigrants [76,176]. A potential explanation is discussed in the literature, and is related to language as a barrier [21]. It seems to have an impact on PA in several ways, including difficulties in accessing knowledge/literacy about PA, health assets, as well as information on when and where to access PA in the host country [21]. Cultural background, host country's attitudes towards immigrants from a specific country, financial limitations, racial harassment and lack of knowledge of host culture could also play a core role on these differences [21,248-253]. This could also be explained under the light of the Greek austerity period and the additional financial barriers that immigrants have compared to the native population [254]. It is widely met that immigrant families can't afford systematic after school activities, which most of the times are costly, and therefore preschoolers are mainly activated during school hours and/or in free of charge sedentary behavior at home [184,248,251].

PA indicators as risk and protective factors for BMI

A wide range of studies has stressed already established PA related risk factors for increased BMI, but mainly focuses on children of other age groups (rather than preschoolers) [255,256]. However, there is some evidence supporting current findings on preschoolers. Preschoolers TV watching, mother's and parental TV watching and sedentary behavior, as well as their nutritional behavior over their children are the major risk factors under discussion [257-259].

Parents' nutritional and PA behavior over preschoolers (e.g. feeding them even when they are not hungry and PA choices, etc) may have a strong impact on child's BMI [89,260]. Such parental attitudes are important, since studies suggest that maternal behavior towards child's feeding and nutritional habits could negatively or positively influence child's food intake, appetite arousal and food portion size [261]. At the same time, evidence explains that components of appetite reactivity have significant effect on child's adiposity which is partly mediated by child's actual food portion size and later affects BMI trends as child gets older) [261].

Strengths and limitations

To the best of our knowledge, this was the first study exploring PA and BMI associations in preschoolers of different ethnicity residing in Attica, Greece with respect to parent's attitudes over child's feeding and PA behaviors. Study design and the already validated questionnaires strengthen study's findings, at least towards exporting reliable conclusions on PA and BMI trends. Continuous monitoring of the survey processes and the satisfying geographical coverage of the kindergartens also enhance study findings that come in agreement with international evidence.

However, there is a range of limitations that should be taken into consideration. These include the absence of power analysis prior sampling (satisfying geographical coverage attempted to minimize this bias) and the un-clustered sampling and the small number of participants per non-indigenous ethnicity group. Core findings should be discussed carefully, since no casual associations exist due to study design (i.e. cross-sectional study).

Implications

"Investing" in the maximizing children's participation in PA activities is multiply beneficial with consequent protective effects, not only for the prevention of obesity, but also in other aspects of children's health, such as bone and skeletal health, cardiometabolic health, motor skill development, cognitive development and psychosocial health [32,33]. On this premise, the need for the integration of movement programs that nurture children's both actual and self-perceived skills within preschool education is warranted regardless ethnicity [76].

Furthermore, this study should become the cornerstone for policy makers in Greece, to enhance sport activities and free access PA programs for preschoolers. Systematic monitoring of these programs in time would be essential for the promotion of healthy behaviors of immigrants, minority groups and the entire Greek population. Following the NASPE guidelines [161], PA interventions in preschoolers should be coordinated and implemented nationally. International evidence recommends family's daily engagement to PA should exceed the 120 minutes of PA and avoid staying inactive for more than 60 minutes at a time (except while sleeping) [161].

Reducing financial barriers to activities, especially for children, could be a beneficial consequence of improving sports participation for low socio-economic groups.

An important public health message should be the idea of PA and health living "investment". The observed burden, associations and identified risk factors could support additional research hypothesis generation, as well as first-level intervention programs in Greece and other countries of similar socio-demographic profile.

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APPENDIX 9: CONFERENCE AWARD OF PRESENTED ANNOWNCEMENT

ΙΝΣΤΙΤΟΥΤΟ ΜΕΛΕΤΗΣ, ΕΡΕΥΝΑΣ & ΕΚΠΑΙΔΕΥΣΗΣ
ΓΙΑ ΤΟ ΣΑΚΧΑΡΩΔΗ ΔΙΑΒΗΤΗ
ΚΑΙ ΤΑ ΜΕΤΑΒΟΛΙΚΑ ΝΟΣΗΜΑΤΑ

ΠΑΝΕΛΛΗΝΙΟ ΣΥΝΕΔΡΙΟ ΠΑΝΕΛΛΗΝΙΑΣ ΕΤΑΙΡΕΙΑΣ ΔΙΑΤΡΟΦΗΣ
ΠΑΝΕΛΛΗΝΙΕΣ ΕΚΠΑΙΔΕΥΤΙΚΕΣ ΗΜΕΡΙΔΕΣ ΠΦΥ "Γ. ΠΑΠΑΔΑΚΗΣ"
2019

Η ΠΑΝΕΛΛΗΝΙΑ ΕΤΑΙΡΕΙΑ ΔΙΑΤΡΟΦΗΣ
ΤΟ ΙΝΣΤΙΤΟΥΤΟ ΜΕΛΕΤΗΣ, ΕΡΕΥΝΑΣ & ΕΚΠΑΙΔΕΥΣΗΣ
ΓΙΑ ΤΟ ΣΑΚΧΑΡΩΔΗ ΔΙΑΒΗΤΗ ΚΑΙ ΤΑ ΜΕΤΑΒΟΛΙΚΑ ΝΟΣΗΜΑΤΑ &
Η Οργανωτική Επιτροπή του Συνεδρίου
ΑΠΟΝΕΜΟΥΝ

3ο ΒΡΑΒΕΙΟ
ΚΑΛΥΤΕΡΗΣ ΠΡΟΦΟΡΙΚΗΣ ΑΝΑΚΟΙΝΩΣΗΣ
για την εργασία με τίτλο:

ΠΑΡΟΜΟΙΟΣ ΔΕΙΚΤΗΣ ΜΑΖΑΣ ΣΩΜΑΤΟΣ, ΔΙΑΦΟΡΕΤΙΚΕΣ ΔΙΑΤΡΟΦΙΚΕΣ ΣΥΝΗΘΕΙΕΣ ΜΕΤΑΞΥ ΝΗΠΙΩΝ ΕΛΛΗΝΩΝ ΚΑΙ ΑΛΛΟΔΑΠΩΝ ΚΑΤΑ ΤΗΝ ΠΕΡΙΟΔΟ ΤΗΣ ΚΡΙΣΗΣ. Ο ΡΟΛΟΣ ΤΗΣ ΟΙΚΟΓΕΝΕΙΑΣ

των κ.κ. Μ. Χρυσίνη, Ι. Τσιλιγιάννη, Δ. Σηφάκη-Πιστόλλα, Ν. Τζανάκη

Αθήνα, 15 Φεβρουαρίου 2019

ΑΝΤΩΝΙΟΣ ΖΑΜΠΕΛΑΣ
Πρόεδρος
Πανελλήνιας Εταιρείας Διατροφής

ΣΤΑΥΡΟΣ Ι.ΠΑΠΠΑΣ
Πρόεδρος
Ινστιτούτου Μελέτης Έρευνας & Εκπαίδευσες για το Σακχαρώδη Διαβήτη και τα Μεταβολικά Νοσήματα