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Convenience sampling of children presenting to hospital-based outpatient clinics to estimate childhood obesity levels in local surroundings

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and lubricants. We believe these findings also underscore the value of affirmative models of sexual health. Attending to pleasure and sexual well-being for both young men and women could gain new insights compared with a disease model alone. ■

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Contributors

J. A. Higgins conceived the study design, oversaw the analyses, and took the lead in writing the article. Y. Wang managed the data, conducted analyses, created tables, and assisted with article preparation.

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Human Participant Protection

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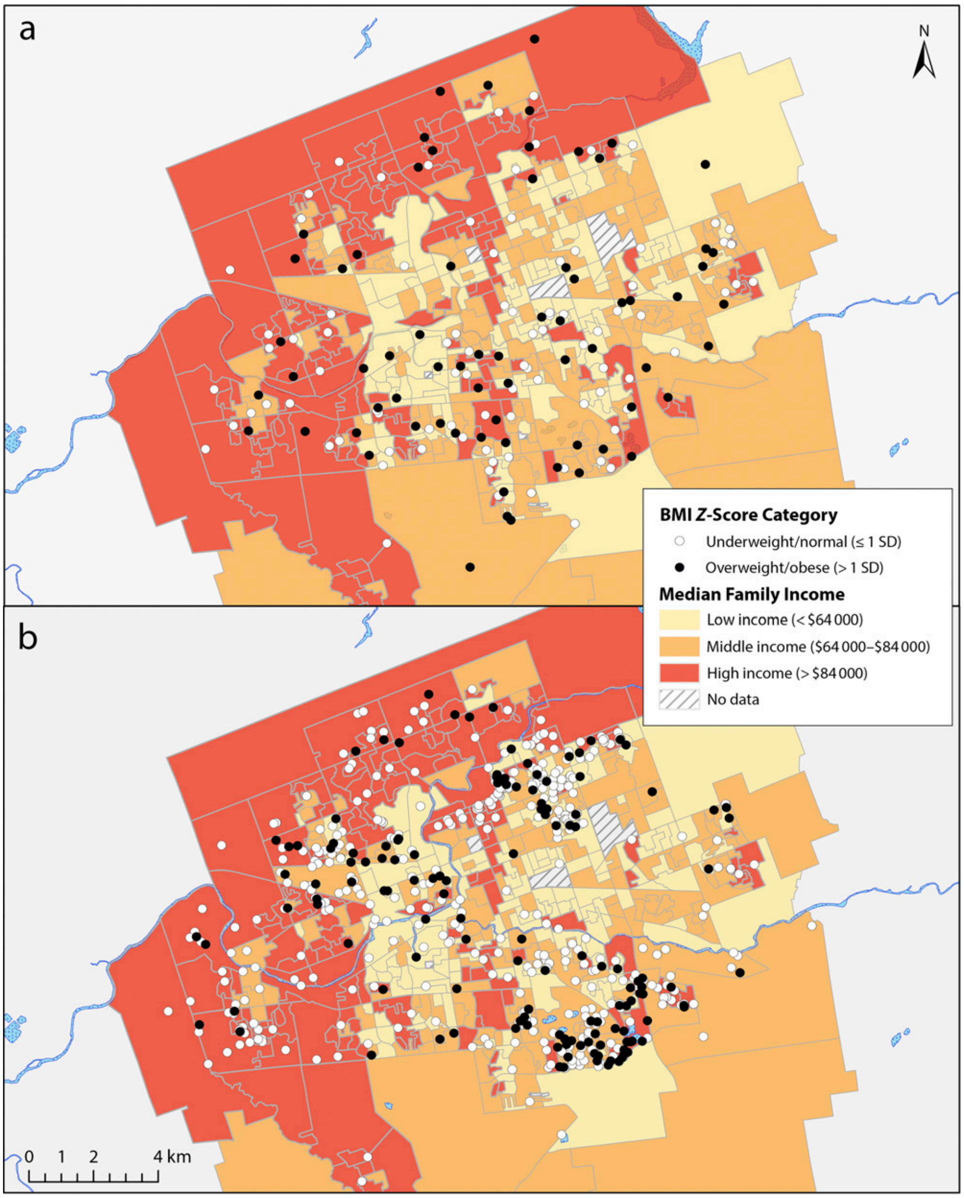
Convenience Sampling of Children Presenting to Hospital-Based Outpatient Clinics to Estimate Childhood Obesity Levels in Local Surroundings

Jason Gilliland, PhD, Andrew F. Clark, PhD, Marta Kobrzynski, BSc, and Guido Filler, MD, PhD

Childhood obesity is a critical public health matter associated with numerous pediatric comorbidities. Local-level data are required to monitor obesity and to help administer prevention efforts when and where they are most needed. We hypothesized that samples of children visiting hospital clinics could provide representative local population estimates of childhood obesity using data from 2007 to 2013. Such data might provide more accurate, timely, and cost-effective obesity estimates than national surveys. Results revealed that our hospital-based sample could not serve as a population surrogate. Further research is needed to confirm this finding. (*Am J Public Health.* 2015;105:1332–1335. doi: 10.2105/AJPH.2015.302622)

Childhood obesity is a worldwide epidemic whose prevalence continues to increase[1–4]; it causes significant health consequences, such as type 2 diabetes, hyperlipidemia, hypertension, and adult obesity.[5–9] Effective evaluation requires local-level data to monitor obesity and to help administer prevention efforts when and where they are needed most. School-based samples are often used to determine the prevalence of childhood obesity; however, schools are becoming increasingly reluctant to allow researchers to collect data because of the



Note. The home locations of participants have been randomized based on the census dissemination area to de-identify the spatial data.

FIGURE 1—Distributions of body index mass (BMI) classification between (a) the hospital-based sample (2007–2008) and (b) the school-based sample (2011–2013): London, Ontario.

perceived burden on teachers and students, issues of student privacy, and the possibility of stigmatizing students with unhealthy weight. Children who visit health care facilities routinely have their height and weight measured using precision scales and stadiometers,[10] so values from this population may accurately estimate regional obesity. In this report, we compared the mean body mass index z-scores (BMI-Z) in a hospital-based sample with a school-based sample to determine whether a hospital-based sample could be used to estimate regional obesity levels.

METHODS

Our study was a secondary analysis of data collected for previously described studies.[11–13] The hospital-based sample, or hospital group, included consecutive patients aged 2 to 18 years who presented to the emergency department or orthopedic clinic at London Health Sciences Centre in London, Ontario, over a 9-month period in 2007 to 2008. Height and weight were measured by staff as part of their visits. The school-based sample, or school group, was collected between 2011 and 2013

TABLE 1—Examining the Differences in Body Mass Index Z-Scores Between the Hospital-Based and School-Based Samples of Participants, Stratified by Gender, Age, and Median Household Income

Variable	Hospital-Based Sample		School-Based Sample		t-Test Results	
	No. (%)	BMI Z-Score	No. (%)	BMI Z-Score	Z-Score	P
Total	162	0.51	526	0.20	−2.742	.003
Gender						
Male	94 (58.0)	0.67	212 (40.3)	0.32	−2.588	.005
Female	68 (42.0)	0.29	314 (59.7)	0.12	−0.666	.505
Age, y						
10	41 (25.3)	0.29	88 (16.7)	0.34	−0.430	.667
11	30 (18.5)	0.88	231 (43.9)	0.21	−3.088	.001
12	50 (30.9)	0.62	158 (30.0)	0.12	−2.652	.004
13	41 (25.3)	0.34	49 (9.3)	0.20	−0.577	.566
Median family income						
Low (< $64 000)	50 (30.9)	0.64	151 (28.7)	0.32	−1.936	.054
Middle ($64 000–$84 000)	42 (25.9)	0.78	186 (35.4)	0.37	−1.856	.065
High (> $84 000)	70 (43.2)	−0.05	189 (35.9)	0.26	−1.720	.087

Note. BMI = body mass index. To achieve a 95% power, a minimum sample size of 212 hospital patients was required.

and included a representative sample of children aged 9 to 14 years who attended 1 of the 31 randomly selected elementary schools throughout southwestern Ontario. Height and weight were measured by study staff, whereas postal codes and basic sociodemographic characteristic data were collected using a parent survey. Our analysis was limited to residents of London who were 10 to 13 years old.

Measures and Statistical Analysis

Age- and gender-independent BMI-Z was calculated.[14] Age, gender, and median family income were used as control variables. Because individual-level income was unavailable, we used median family income of the dissemination area (DA) in which the child resided.[15] To determine DA median family income[16] for each child, home locations based on postal code centroids were mapped in a geographic information system,[17] and DA-level income was spatially joined to the intersected home location.

We performed 4 analyses using SPSS Statistics version 21 (IBM, Armonk, NY). We used a difference-in-means test to compare group differences in BMI-Z; a χ^2 test to compare distributions of gender, age, and income, which are 3 well-known correlates of BMI[18–21]; and a series of difference-in-means tests to compare group differences in BMI-Z across age, gender, and income. We used the Mann–Whitney–Wilcoxon (non-normal) and independent samples *t*-test (normal), as determined by a Kolmogorov–Smirnov test of normality. An analysis of covariance (ANCOVA) was used to determine if controlling for age, gender, and income eliminated between-group differences in BMI-Z.

RESULTS

The spatial distribution of BMI-Z for each group is shown in Figure 1, and the analysis results are listed in Table 1. The mean BMI-Z in the hospital group was significantly greater than that in the school group. Our χ^2 analysis to compare the distribution of key demographic characteristic data found significant differences between the distribution of gender ($\chi^2 = 15.749$; $P < .001$) and age ($\chi^2 = 50.166$; $P < .001$), but not income ($\chi^2 = 5.267$; $P = .067$).

We used a series of *t*-tests and ANCOVA tests to determine if significant differences between hospital and school groups existed. When stratified by gender, BMI-Z was significantly higher among boys in the hospital group. When stratified by age, BMI-Z among 11- and 12-year-old children was significantly higher in the hospital group. Stratifying the 2 groups by median family income found no significant differences in BMI-Z at any income level. When controlling for gender, age, and median family income independently, the ANCOVA analysis found the adjusted BMI-Z to be significantly different between school and hospital groups for each covariate.

After understanding how BMI-Z compared between the 2 groups in a bivariate analysis, we conducted an ANCOVA analysis to understand how BMI-Z differed between groups while controlling for gender, age, and income. Our final analysis adjusting the means for all 3 covariates found a significant difference between hospital and school groups ($F = 7.216$; $P = .007$). The margin of error with 95% confidence intervals $(Z_{\alpha/2})(SD/\sqrt{n}) = 1.96\,(1.24/\sqrt{688})$ was 0.09 or 9%.

DISCUSSION

Our study demonstrated that our school and hospital groups had significant differences in BMI-Z, when controlling for 3 common correlates of obesity (gender, age, and income). There were a higher proportion of boys and low-income children in the hospital group and of girls in the school group, which was consistent with previous studies.[13,22–25] Bivariate analysis found no significant difference in BMI-Z between groups when controlling for family income; however, a covariance approach indicated that none of the 3 demographic variables accounted for variance in the BMI-Z. Therefore, our study added to the literature by suggesting that a hospital-based sample could not be used for estimating obesity levels among a general population.

These results led to further questions as to what characteristics of the hospital and school-based samples helped explain the differences in BMI-Z. Future research needs to compare the 2 groups while controlling for other correlates of obesity, such as characteristics of social and built environments. The limitations of our study included a moderate hospital sample size, school sampling strategy, lack of generalizability to other regions, and the inherent limitations of data derived from census data rather than individual family income. ■

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Contributors

J. Gilliland was the principal investigator on the project involving the school-based sample. He conceptualized the article and methodology, supervised the analysis, and co-wrote the first draft of the article. A. F. Clark was the project manager for the collection of data for the school-based sample, conducted the analyses, and co-wrote the article. M. Kobrynski assisted in the writing and editing of the final article. G. Filler was the principal investigator on the project, collected data from the hospital-based sample, helped develop the methodology used for analysis, and edited the article. All authors approved the final article for publication.

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Human Participant Protection

The study was approved by the institutional ethics review board of the University of Western Ontario (#13746E, #17918S) and ethics officers from the 4 school boards.

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