

Bridging the Gap's *Food and Fitness* Elementary School Survey:

Technical Report on Survey Development, Sampling, and Methodology

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Overview

This technical report provides a description of the research procedures followed during the development, administration, and collection of survey data gathered by the *Food and Fitness* project. *Food and Fitness* is part of the larger Bridging the Gap (BTG) research program, which is a research initiative funded by the Robert Wood Johnson Foundation. *Food and Fitness* involved annual surveys of school-level respondents at elementary schools from the 2006–07 to the 2013–14 school years. These data were collected in conjunction with two other key elements of BTG: 1) collection and coding of written school district wellness policies in all of the corresponding public school districts in which *Food and Fitness* public elementary schools were located; and 2) a parallel school-level survey administered in secondary schools—the *Youth, Education, & Society* survey—which was conducted by the BTG team at the University of Michigan.

The development of the school samples and analytic weights was conducted by survey methodology experts at the Institute for Social Research at the University of Michigan. Some information included in this report is excerpted from technical reports and detailed documentation that was provided by the sampling consultants. For additional details, please contact the first author.

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Research Design and Procedures

Sample development

Two primary goals of the *Food and Fitness* survey project were: a) to obtain nationally-representative information on school practices; and b) to obtain information about the association between district-level wellness policies and practices in those schools. Thus, the sample selection was designed to produce a nationally-representative sample of elementary schools, within a nationally-representative sample of school districts. A goal of selecting at least two schools within each district was established to enable estimation of the impact of school-level versus district-level policy impacts. This was done via a multi-stage sampling design where districts were selected at the first stage, and schools (within selected districts) were selected at the second stage.

In addition, from 2006–07 to 2011–12, a separate nationally-representative sample of private elementary schools was identified. Approximately 12 percent of elementary school students attend private schools, therefore information from private schools is highly relevant for understanding the health-related practices at elementary schools across the country. Together, the public and private school data provide a complete picture of the school environment experienced by elementary school students in the United States.

Selection of each year's sample was conducted by the Institute for Social Research at the University of Michigan.

Selection criteria

Because elementary schools across the country often vary in grade groupings (e.g., Kindergarten through grade 2; grade 3 to grade 5; Kindergarten to grade 12), for the purposes of this study, elementary schools were defined to be those that included a grade 3 class. In addition, to allow for weights to be developed to provide inference to the number of students across the country impacted by school practices, a minimum threshold of 20 students in grade 3 was established. Thus, all schools in these samples include at least one grade 3 class, with at least 20 enrolled grade 3 students.

For consistency with the corresponding secondary school survey called *Youth, Education, & Society*—also part of Bridging the Gap—which began 1997 and had therefore been conducted for ten years prior to the initiation of the *Food and Fitness* study, similar selection criteria were utilized. Only schools in the coterminous United States were included in the sample. Schools were not included if they were located in Alaska, American Samoa, Department of Defense overseas, Guam, Hawaii, Northern Marianas, Puerto Rico, or the Virgin Islands. Schools were not included if they were alternative schools (i.e., transitional, psychiatric, detention, correctional), virtual or online-only schools, or homeschool coordination programs. Schools were also excluded if they were also sampled/selected for the Monitoring the Future study, which was conducted by the same team that conducts the *Youth, Education, & Society* survey at the University of Michigan. Department of Defense domestic schools and Bureau of Indian Affairs schools were included, as were charter and magnet schools.

Sample frame

The sample frame for all years of this study was the Common Core of Data (CCD), which is made publicly available online by the National Center for Education Statistics (<http://nces.ed.gov/ccd/>). Due to a time lag in availability of the CCD datasets and the time required for development of the frame and selection of the sample, the year of CCD data was generally representative of relevant school characteristics (i.e., grade 3 enrollments) two to four years prior to recruitment for this study.

Sample screening and identification of ineligible schools

Prior to fielding the surveys each year, a pre-screening process was conducted. Online web searches were used to verify each school's address and phone number. Subsequently, all schools were telephoned to verify the mailing address, principal's name, and principal's title (e.g., Dr., Mr., Mrs., Sister, Reverend). Through this process, each year it was determined that some schools were ineligible for the study and had been misclassified on the sample frame. Schools were ineligible either because they had closed (the most common reason), or because they did not actually include a grade 3 class (i.e., preschool only, or middle/high school). The number of ineligibles each year is shown in Table 1, and ranged from 1.0% to 3.1% of the total sample in each year.

Table 1 indicates which year of data were used for the frame, and the number of schools that were subsequently determined to be ineligible during screening or recruitment.

Table 1: Food and Fitness public school sample sources and eligible sample sizes

Survey Year	School Year	Sample source	N sampled	N ineligible	N eligible
1	2006–07	CCD 2004–05	1070	11	1059
2	2007–08	CCD 2004–05	1070	11	1059
3	2008–09	CCD 2005–06	1070	32	1038
4	2009–10	CCD 2005–06	1070	15	1055
5	2010–11	CCD 2005–06	1070	28	1042
6	2011–12	CCD 2008–09	1075	38	1037
7	2012–13	CCD 2008–09	1075	24	1051
8	2013–14	CCD 2008–09	1075	30	1045

CCD: Common Core of Data

Selection, replacements, rotation, and overlap

In all years, a two-stage selection approach was used, with a nationally-representative sample of districts selected first, followed by a sample of schools from within those districts. In Years 1–5 the sampling approach used a probability proportional to size (*pps*) method, switching to a stratified simple random sample (*stsr*s) for Years 6–8.

In Years 1–5, groups of public school districts were formed and a sample of district groups was selected. District groups (DGs) were created so that each DG contained a sufficient number of schools to allow multiple schools to be selected from within those district groups. Replacements were also identified, to be used if desired due to

nonresponse; these replacements were only used between years, such that any returning but non-responding schools were not re-contacted in the following year. A total of 400 public school districts were selected using *pps*; however, some large districts were selected more than once, thus the number of unique districts selected was less than 400. A systematic *pps* school sample was then selected from each year's school sample frame, which was sorted by: SRC 1990 National Sample strata, FIPS state code, urbanicity, 5-digit zip code, and district group identification number. The measure of size for selection was the number of grade 3 students.

In Years 6–8, the same characteristics were used to create explicit strata, within which equal probability samples of DGs were selected. Again, a measure of size was used to create strata, but the measure of size was the square root of the number of 3rd grade students (differing from Years 1-5). This was designed to cause less variation in selection probabilities than in the previous design. To the extent possible, the same district groups were used for the Year 6 frame as were used in Year 5, to allow the overlap of the two years' samples to be controlled. As in prior years, the district file was sorted by: SRC 1990 National Sample strata, FIPS state code, urbanicity, 5-digit zip code and district identification number. Thereafter, schools were selected from within each sampled district group. Each DG was required to have at least 6 schools. This was sufficient to cover the maximum sample allocation of 3 schools per district, with a potential replacement for each.

Year 1. Intended initially as a one-year cross-sectional study, this year's sample was selected as described above, based on a sampling frame that used the CCD 2004–05.

Year 2. The second-year sample was based on the Year 1 sample, with re-recruitment of 578 responding schools, and replacements for 481 non-responding schools.

Years 3 to 5. After the first two years of the study, a rotation approach was introduced to reduce the burden on schools. Again, a two-stage *pps* approach was used, with districts selected first, and then schools selected *pps* within district. The samples for Years 3–5 utilized a planned rotation of districts and schools, so that in each year ~2/3 of the school remained in the sample, while ~1/3 rotated out. Thus, in Year 3, ~2/3 of the sample overlapped from the Year 2 sample, while ~1/3 was completely new. After using all three years of sample identified with this method (up to Year 5), it was determined that computing the selection probabilities was increasingly difficult due to saturation of the sample. Therefore, in the final years of the study, the sampling methodology switched to a stratified simple random sample (*stsr*s). The plan for this transition was deliberately developed to ensure comparability of data yielded from each year, across the entire duration of the project.

Years 6 to 8. The samples for Years 6–8 were all drawn in 2010, based on the CCD 2008–09. Again, rotation groups were used so that some overlap was built into the district-level selections. At the school level, some overlap also occurred, but replacement schools (the next school on the frame in the order used for selection) were identified and used for between-years replacement of returning non-responding schools; this reduced some of the year-to-year overlap in the school samples.

Private schools

In addition to the nationally representative samples of public schools, this study also included private schools from 2006–07 to 2010–11. Thereafter, due to resource limitations, the private school survey was discontinued. Each year, a sample of ~400 private elementary schools was selected from the Private School Search database. This resource is also publicly available online, provided by the National Center for Education Statistics (<http://nces.ed.gov/surveys/pss/>). The private school sample was drawn using a single stage probability proportional to size (*pps*) design in which the measure of size variable was the number of grade 3 students enrolled in the school. For consistency with the public school sampling procedure, schools from Alaska and Hawaii were excluded, as were alternative or early-childhood-only programs (i.e., not including grade 3). Schools of all religious affiliations and types (e.g. regular, Montessori, special education), and gender status (co-educational, all male, all female) were included on the sampling frame. Again, schools that were determined during screening to be closed or not including grade 3, were considered ineligible.

Table 2: Food and Fitness private school sample sources and eligible sample sizes

Survey Year	School Year	Sample source	N sampled	N ineligible	N eligible
1	2006–07	PSS 2005–06	400	9	391
2	2007–08	PSS 2005–06	400	2	398
3	2008–09	PSS 2005–06	400	10	390
4	2009–10	PSS 2005–06	400	3	397
5	2010–11	PSS 2007–08	401	7	394
6	2011–12	PSS 2007–08	402	12	390

PSS: Private School Search

Measures

Initial development of measures

After receiving the first round of funding for this project (for one year), work commenced immediately on the development of the *Food and Fitness* elementary school survey. Survey development began in late 2006, with a review of similar existing instruments and development of original items to assess key topics relevant to childhood obesity, including many aspects of the school nutrition and physical activity environments. With one of the key goals of this project being an evaluation of the school-level implementation of district-level wellness policies, the survey specifically focused on components of the federal wellness policy mandate, including guidelines for nutrition education, school meals, competitive foods and beverages, physical activity, and wellness policy development and implementation.^a Several sources were used to identify existing items that could be adopted for this study, including: a) the School Health Policies and Programs Study (SHPPS) in 2000 (the SHPPS 2006 study was still in the field when *Food and Fitness* was beginning); b) a survey used by the National

^a Many of the survey items assess topics identical to those included in the wellness policy coding scheme used by Bridging the Gap, and were developed to be aligned to the coding dimensions used in Year 1 of the written wellness policy evaluation.

Center for Education Statistics in 2005 for the report *Calories In, Calories Out: Food and Exercise in Public Elementary Schools, 2005* (<http://nces.ed.gov/Pubs2006/nutrition/>); c) information reported by the School Nutrition and Dietary Assessment study in the second (1991–1992) and third (2004–2005) rounds of data collection. Primarily, the source for the *Food and Fitness* survey was the existing *Youth, Education, & Society* survey that was already in use by the Bridging the Gap team at the University of Michigan. This survey was used as the base for the *Food and Fitness* survey, with adaptations where suitable for elementary schools versus secondary schools (e.g., removing items regarding whether the campus is open or closed; adding items about recess). Many of the items on the *Youth, Education, & Society* survey had already been pre-tested, and/or adopted from other sources noted above (e.g., the SHPPS surveys).

After developing a preliminary version of the Year 1 survey, the project director (a doctorally-trained psychometrician specializing in school health research) sought and received feedback from the broader Bridging the Gap team, which included expertise from a variety of content areas, including nutrition, health policy, health economics, and health behavior. Next, external reviews were obtained by four national experts on child nutrition and physical activity, including two who had been investigators on the USDA-supported School Nutrition and Dietary Assessment-III study. Finally, to ensure respondent comprehension, cognitive interviews were conducted with three target respondents (elementary school principals—who were not part of the study sample), and the survey was revised accordingly.

Revision of measures

In the second year of the study, minor modifications were made to some of the survey items, based on additional feedback and results of the Year 1 survey data. This iterative process of refining measures to obtain more-precise and more-useful information continued for the duration of the project. However, a key priority throughout was to preserve continuity with prior items, in order to allow for multi-year comparisons. In other words, revisions were not made unless the cost of lost continuity was outweighed by improved precision and validity. In addition, a priority was placed on preserving connections among the two parallel survey elements of Bridging the Gap: the elementary school survey, *Food and Fitness*, and the secondary school survey, *Youth, Education, & Society*. Therefore, the revision process was coordinated among the two teams, with coordination of proposals to revise various items in the fall of each year, prior to finalizing the surveys to be fielded in January of the subsequent year (i.e., second-half of the school year).

With additional funding to continue the surveys for several years, and changes over time in the national food policy landscape (i.e., passage of the Healthy, Hunger-Free Kids Act of 2010), it became even more desirable to add new measures to the survey. Doing so also allowed the opportunity to track implementation of specific elements of the law, as well as to assess relevant and timely topics. When new items were added, they were reviewed by the entire BTG research team (eight doctoral-level researchers, including registered dietitians and experts in survey research and methodology, as well

as expertise in relevant content areas). In many cases, the items were developed to align directly to the content of new laws or policies and therefore had face validity.

Due to the need to tailor specific items to assess many different school-level practices, and variations in the sources of measures, a variety of response metrics are used throughout the survey. Analyses reported elsewhere typically explain how survey items were worded, how responses were measured, and—if applicable—how responses were collapsed into composite variables that were created by combining multiple survey items (e.g., examining availability of bottled water in all competitive sales venues) or created by reducing responses for comparison with certain standards (e.g., examining whether physical education time met recommended levels). These analytic decisions are made on a topic-by-topic basis; the survey items were intended to allow maximum flexibility (i.e., asking about recess in a way that allow for differing cut-points of minutes per day rather than simply a binary yes/no of whether current best-practice standards of 20 minutes per day were met). Copies of all of the survey instruments are available at www.bridgingthegapresearch.org/research/elementary_school_survey/.

Data Collection

Data collection: overview

Data for this study were collected via survey (mail-back and online) from staff at nationally representative samples of public and private elementary schools.

Recruitment and participation

Prior to fielding the survey, project staff telephoned each school to verify the name of the principal and the school's mailing address, then mailed a personalized invitation letter and survey to the principal at each school. In all years, a \$100 payment was offered for responding, to be paid either to the respondent or to the school. In Year 1 the payment was sent after the completed survey was returned to the researchers. From Year 2 onward, the payment (a check made out to the principal) was sent with the survey, with a request that it be shredded or returned if the principal did not intend to complete the survey. This pre-payment approach is often used in survey research to maximize response rates. Very few principals cashed the check but did not actually return the survey (fewer than .5% in all years). In several cases, the check was cancelled and re-issued to a different individual, or to the school, at the principal's request. The Survey Research Lab at the University of Illinois at Chicago was contracted to provide the follow-up support for this project, following up with multiple reminder calls, e-mails and letters.

The survey included two parts. The instructions requested that the principal or another school administrator complete Part 1 of the survey, which included items about school characteristics, physical activity practices, various competitive food and beverage practices, and development and implementation of wellness policies. A second, separate, differently-colored part of the survey asked for details about the specific foods and beverages offered during school lunches and in competitive venues. The invitation letter requested that Part 2 be completed by a food service manager, cook or other staff

with knowledge of food service practices. In most schools the surveys were completed by a combination of multiple staff members (e.g., principals, food service managers, teachers, nurses).

Recruitment timing

For Year 1, recruitment began in April and ran primarily during the spring and summer. Recruitment remained open through October, but few additional surveys were received during the fall months. For Year 2, recruitment began in February and ran primarily during the spring and summer. Recruitment remained open through September but, again, very few additional surveys were received during the fall months. For Year 3 onward, recruitment began in mid-January, and ended by August of each year.

Online surveys

At the request of several respondents in the early years of the project, an online survey option was implemented, beginning in Year 3 of the study. Survey Gizmo was used for the online data capture. Two separate modules were programmed—consistent with the protocol used for the paper surveys—with a request that the first module be completed by the school administrator, and the second module be completed by school food service personnel. The percentages of respondents who used the online version ranged across years, from 10% to 19% of cases (schools).

Response rates

After removing ineligible schools (closed or not actually an elementary school), the total number of eligible schools each year was used as the denominator for calculating response rates. The numerator is the number of responding schools. The calculation uses the American Association for Public Opinion Research’s response rate number two^b, which counts partially-completed surveys as responses.

Table 3: Number of responding schools and response rates, by year

Survey Year	School Year	Public Schools			Private Schools		
		N responding	N eligible	RR	N responding	N eligible	RR
1	2006–07	578	1059	54.6%	259	391	66.2%
2	2007–08	748	1059	70.6%	336	398	84.4%
3	2008–09	641	1038	61.8%	297	390	76.2%
4	2009–10	680	1055	64.5%	313	397	78.8%
5	2010–11	598	1042	57.4%	289	394	73.4%
6	2011–12	553	1037	53.3%	270	390	69.2%
7	2012–13	623	1051	59.3%			
8	2013–14	640	1045	61.2%			

RR: response rate

^b Association for Public Opinion Research. *Standard definitions: final dispositions of case codes and outcome rates for surveys, revised 2011*. 2011. Available at: http://www.aapor.org/AAPORKentico/AAPOR_Main/media/MainSiteFiles/StandardDefinitions2011_1.pdf.

Data Processing, Weighting, and Analysis

Data processing

After being returned in the mail, surveys were individually coded and entered electronically via an SPSS data entry module that was custom-programmed for the project. To ensure data quality, each survey was double entered. During the second round of entry, the data entry software provided automated detection of discrepancies, allowing for immediate reconciliation of inaccurate first-round entries (which were rare). Responses submitted online through Survey Gizmo were cleaned, coded, and merged with the electronic capture of the data that had been obtained via paper surveys.

Weighting

In addition to developing the samples, the survey methodology consultants at the Institute for Social Research at the University of Michigan also developed analytic weights for this project.^c With the initial development of each year's sample, selection probabilities were established, which were used in the development of analytic weights. Weights were calculated based on the following formulas:

$$w_{\text{school}} = 1 / (P_{\text{dist_grp}} * P_{\text{sch|dist_grp}})$$

$$P_{\text{dist_grp}} * P_{\text{sch|dist_grp}} = \frac{a \cdot MOS_{\text{dist_grp}}}{MOS_{\text{tot}}} \frac{1070}{400} \frac{MOS_{\text{sch}}}{MOS_{\text{dist_grp}}^*}$$

MOS is the measure of size (based on grade 3 enrollment); *sch* stands for school, and *dist_grp* stands for "district group" (also noted as DG), all of which are described in more detail in the sampling section above.

After the survey collection periods were closed, nonresponse-adjusted data weights were calculated by the consultants at the Institute for Social Research. These calculations adjusted for potential differences in patterns of responding by schools with different demographic characteristics (e.g., smaller schools were significantly more likely to respond than were larger schools). The propensity models accounted for the following school characteristics: census region; urbanicity; percentage of white students; percentage of black students; percentage of Latino students; Title 1 eligibility; number of grade 3 students; region x percentage black students; and region x percentage Latino students. Thereafter, poststratification was used to further adjust the nonresponse adjusted weights, with the goal of reducing bias and increasing precision of sample estimates. These poststratification adjustments used census region and number of grade 3 students.

Student-level weights. For comparability with the parallel *Youth, Education, & Society* survey, which utilizes only student-level weights, a second set of weights was also developed. These weights allow for inference to all grade 3 students in the United States. Such weights are particularly important at the secondary school level, where

^c A simplified version is presented here; for additional detail please contact the first author.

school enrollments can vary from several hundred to several thousand at any given school; although the enrollments numbers at elementary schools generally have less dispersion than at secondary schools, in some circumstances it can still be desirable to make inferences to the percentage of *students* impacted by a certain practice, rather than the percentage of *schools* that engage in a practice. All analytic projects that examine *Food and Fitness* and *Youth, Education, & Society* elementary and secondary school survey data together utilize these student-level weights. The student weights for each case (school) were computed by multiplying the number of students in grade 3 at each school by the school-level weight.

Analyses

Analyses reported elsewhere vary depending on the specific research question and analytic approach. However, owing to the complex sampling design, data are always analyzed with the *svy* (survey) command in STATA, with clustering on school district identification number to account for the increased similarity among schools from within the same district. Private schools are considered to come from unique districts, but when included in analyses with public schools, the private schools have a district-level identifier (unique to each school) to allow the clustering that is necessary for other (public) schools when analyzed in combined datasets.

Examination of the final datasets shows that—as planned—there was considerable clustering of public schools within districts. The table below shows the number and percentage of schools within district for each year.

Table 4: Allocation of study schools by district, for each year of the study

	Number of schools per district								Total N districts
	1 school per district		2 schools per district		3 schools per district		4+ schools per district		
	N districts	% districts	N districts	% districts	N districts	% districts	N districts	% districts	
2006–07	268	66.3	106	26.2	26	6.4	4	1.0	404
2007–08	277	59.1	124	26.4	63	13.4	5	1.0	469
2008–09	273	64.7	101	23.9	39	9.2	9	2.0	422
2009–10	303	65.2	120	25.8	38	8.2	4	0.8	465
2010–11	335	73.1	106	23.1	17	3.7	0	0	458
2011–12	326	75.5	91	21.1	15	3.5	0	0	432
2012–13	361	74.7	104	21.5	18	3.7	0	0	483
2013–14	364	74.1	106	21.6	21	4.3	0	0	491

Numbers and percentages are not weighted.

Percentages sum to 100 across rows, but due to rounding may not sum to exactly 100.0.

School demographic characteristics

Analyses reported elsewhere for *Food and Fitness* data almost always account for school-level contextual covariates. These are generally computed in the same way across analyses, regardless of other elements of the analyses. The contextual covariates are drawn from the CCD data files, for the corresponding year of school data. In other words, for the schools that provided survey data in 2006–07, corresponding

school demographic data were merged into the files, based on the CCD 2006–07 public-use data files. Although the demographic characteristics of each school (e.g., percentage of students eligible for free/reduced-priced meals) does not generally vary widely from one year to the next, this year-matched approach is the most precise way to indicate school-level characteristics. As of the time of this report, CCD data are not yet available for the 2013–14 school year, so the only exception to this protocol is for the 2013–14 school data; analyses for those data use school-level characteristics for each school obtained during the prior (2012–13) school year, which is currently available. The characteristics of all schools included in the sample, using the standard categorizations of school characteristics followed by BTG researchers, are shown below in Table 5. These estimates are weighted, so that each school is fairly represented in its contribution to the overall sample.

Table 5. Characteristics of public elementary schools participating in the Food and Fitness project, by year

	Study Year and School Year							
	1	2	3	4	5	6	7	8
	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14
	----- Percentage of schools -----							
Region								
Northeast	17.0	17.1	16.9	16.9	16.7	16.3	16.4	16.9
Midwest	26.5	25.8	25.1	25.1	24.3	24.5	24.6	24.0
South	33.2	34.4	35.0	35.0	35.7	35.6	35.5	36.0
West	23.4	22.7	23.0	23.0	23.3	23.6	23.4	23.1
Locale								
City	29.1	29.9	32.6	29.4	33.7	33.9	33.9	30.9
Suburb	31.3	32.5	30.3	34.9	27.1	29.4	31.0	36.6
Town	10.8	10.9	12.5	9.7	12.8	10.9	9.8	10.3
Rural	28.9	26.7	24.7	25.9	26.4	25.8	25.3	22.1
Percentage of students eligible for free/reduced-priced meals								
<33% eligible	33.8	32.7	30.8	26.4	24.8	23.7	25.9	25.1
>33% to <66% eligible	37.2	38.9	35.1	37.3	37.6	37.8	36.1	36.5
>66% eligible	29.1	28.4	34.1	36.4	37.6	38.5	38.0	38.4
School size (number of students total)								
<450 students	47.9	50.2	48.2	51.4	48.5	47.8	46.3	43.0
451 to 621 students	28.7	28.9	31.3	29.0	29.6	30.2	31.6	35.8
>622 students	23.4	20.8	20.5	19.7	21.8	22.0	22.1	21.2
Student race/ethnicity								
Predominantly (≥66%) White Non-Latino	51.3	50.7	46.0	47.6	44.7	41.1	40.4	39.6
Majority (≥50%) Black Non-Latino	9.9	9.8	11.3	12.1	10.1	11.6	13.6	10.8
Majority (≥50%) Latino	15.6	16.1	16.2	15.3	19.5	18.9	20.5	19.9
Other	23.2	23.4	26.5	25.0	25.7	28.5	25.5	29.6

Estimates are weighted, using school-level weights.

Percentages sum to 100 vertically within section, but due to rounding may not sum to exactly 100.0.