Fathers' Representation in Observational Studies on Parenting and Childhood Obesity: A Systematic Review and Content Analysis

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Background. The involvement of fathers in caregiving has increased substantially over the past 30 years. Yet in child and adolescent psychopathology, few studies include fathers as research participants and few present results for fathers separate from those for mothers. We test for the first time whether a similar pattern exists in research on parenting and childhood obesity.

Objectives. To conduct a systematic review and quantitative content analysis of observational studies on parenting and childhood obesity to (1) document the inclusion of fathers, relative to mothers, as research participants and (2) examine characteristics of studies that did and did not include fathers. This study presents new data on the number and gender of parent research participants.

Search methods. We searched title, abstract, and Medical Subject Headings term fields in 5 research databases (PubMed, EMBASE, Academic Search Premier, PsycINFO, and CINAHL) using terms combining parents or parenting (e.g., mother, father, caregiver, parenting style, food parenting) and obesity (e.g., obesity, body weight, overweight) or obesity-related lifestyle behaviors (e.g., diet, snacking, physical activity, outdoor play, exercise, media use).

Selection criteria. We identified and screened studies as per the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) published between January 2009 and December 2015, examining links between parenting and childhood obesity, including parents or caregivers as research participants, and written in English. We excluded interventions, nonhuman studies, dissertations, conference abstracts, and studies on youths with specific medical conditions. Of 5557 unique studies, 667 studies were eligible.

Data collection and analysis. For each of the 667 studies, 4 coders were trained to code characteristics of the study (e.g., publication year, geographic region, journal, study focus) and parent research participants (e.g., parent gender, demographic background, biological relationship with child, and residential status). We established intercoder reliability before coding the full sample of studies (mean Krippendorf's alpha = .79; average percentage agreement = 94%).

Main results. Of the studies, 1% included only fathers. By contrast, 36% included only mothers. Although slightly more than 50% of studies (n = 347) included at least 1 father, only 57 studies reported results for fathers separate from those for mothers. When we combined them with studies including only fathers, 10% of studies overall reported results for fathers. Samples sizes of fathers were small compared with mothers. Of studies with fathers, 59% included 50 or fewer fathers, whereas 22% of studies with mothers included 50 or fewer mothers. The mean sample size for fathers across all eligible studies was 139, compared with 672 for mothers. Overall, fathers represented 17% of parent participants across all eligible studies.

Conclusions. This study unequivocally demonstrates that fathers are underrepresented in recent observational research on parenting and childhood obesity.

Public health implications. The underrepresentation of fathers in obesity research compromises the development of effective family interventions for childhood obesity prevention. Targeted opportunities and incentives are needed to support research with fathers. (The full article is available online. *Am J Public Health*. 2016;106:1980, e14–e21. doi:10.2105/AJPH.2016.303391)

PLAIN-LANGUAGE SUMMARY

We examined the representation of fathers in observational studies on parenting and childhood obesity by (1) assessing the proportion of studies that included fathers as research participants and (2) examining differences in the characteristics of studies that did and did not include fathers. We searched 5 research databases and screened studies with published guidelines. Eligible studies included observational studies that were published between January 2009 and December 2015, examined links between parenting and childhood obesity, included parents or caregivers as research participants, and were written in English. Our search yielded 5557 unique studies of which 667 met eligibility criteria. Four trained coders recorded study and parent characteristics for each study. Only 1% of studies included only fathers; by contrast, 36% included only mothers. Although 52% of studies included at least 1 father, only 10% of studies included fathers as research participants and presented results for fathers separate from mothers. Overall, fathers represented 17% of parent participants across all eligible studies. This study provides clear evidence that fathers are underrepresented in research on parenting and childhood obesity. The underrepresentation of fathers compromises the development of effective family interventions for childhood obesity prevention.

Childhood obesity is an entrenched global health challenge that has broad-reaching health implications for individuals and populations.[1] In addition to diseases and illnesses such as type 2 diabetes, asthma, and sleep apnea, obesity and its associated lifestyle behaviors affect children's mental health, executive functioning, academic performance, and social relationships.[2–4] As lifestyle behaviors—including diet, physical activity, screen use, and sleep—emerge early in life and show habitual tendencies across the life course,[5–8] parents and families are crucial stakeholders in childhood obesity prevention. The widely recognized role of the family has led to a robust research literature on parenting practices and family environmental factors that may be targeted in interventions to promote healthy lifestyle behaviors and optimal growth in children. The ever-changing nature of families, including household structures and parenting roles, however, poses a challenge for this research and subsequent obesity-prevention strategies.

Mothers and fathers have historically had clearly delineated gendered roles, with mothers adopting the majority of caregiving responsibilities. However, over the past 30 to 40 years, this pattern has shifted. Alongside increases in maternal employment, fathers' involvement in caregiving in the United States has almost tripled since 1965.[9] Such activities extend to preparing meals for and feeding children. In a 2013 report of a large nationally representative US sample, more than 70% of fathers co-residing with children aged 5 years or younger reported that they fed or ate a meal with their child every day over the previous 4 weeks.[10] Although fathers are increasingly engaged in caregiving activities, recent research suggests that father engagement in parenting interventions is low.[11] This pattern is problematic because interventions may not reach their full potential when parent training is limited to 1 caregiver. In a meta-analysis of parent training programs, studies that included fathers reported more positive changes in child outcomes and parenting practices than studies that only included mothers.[12]

The design of parenting interventions that are compelling to all caregivers may be stymied by the lack of inclusion of fathers in observational studies informing their development. In 1992[13] and 2005,[14] Phares et al. documented the relative lack of fathers compared with mothers in research on child and adolescent psychopathology. One percent of studies included only fathers, whereas 48% of studies included only mothers. Moreover, when fathers were included in studies, their data were typically aggregated with the mothers' data because of the small number of fathers included and a focus on the mother–child dyad.[13,14] As noted by Panter-Brick et al.,[11] the relative exclusion of fathers in parenting research is poor professional practice and bad science as it creates gaps in the evidence base informing parenting interventions.

The relative lack of fathers in parenting research is likely to be more pronounced in caregiving areas with strong gender-based roles such as child feeding. Although it has been suggested that fathers are underrepresented in child feeding, and obesity research in general,[15–18] the extent of their representation is unknown. In light of fathers' increasing involvement in feeding children and relevance as stakeholders in childhood obesity prevention, it is crucial to document their representation in research informing such interventions. The resultant information can guide further research and ensure the compilation of an evidence base on fathering and coparenting approaches to promote healthy lifestyle behaviors in children.

In this study, we conducted a systematic review to identify and screen observational studies on parenting and childhood obesity published between 2009 and 2015[19] and used quantitative content analysis to (1) document the inclusion of fathers or male caregivers compared with mothers or female caregivers as research participants and (2) examine characteristics of studies that did and did not include fathers, with a particular focus on fathers from disadvantaged backgrounds. We examined the inclusion of fathers in family-based childhood obesity interventions in a separate study. Although a number of reviews of family interventions for childhood obesity prevention have been conducted,[20–22] we are not aware of any published systematic reviews on the inclusion of fathers in research on parenting and childhood obesity. This study builds on a larger systematic review on parenting and childhood obesity completed by our research team[19] and presents new data on the number and gender of parent participants in each study.

METHODS

Our search protocol was consistent with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines[23] (Figure 1 and Table A, available as a supplement to the online version of this article at http://www.ajph.org). Following the identification of eligible studies, we conducted a quantitative content analysis with recommended methods[24] to extract and report the relevant data to address our research questions. Here we provide a brief description of our review and coding protocol; a detailed description is published elsewhere.[19] This review is not registered with PROSPERO or other systematic review databases because the authors were not aware of the registration system when the review process began in 2014.

We searched 5 research databases (PubMed, EMBASE, Academic Search Premier, PsycINFO, and CINAHL) by using search terms that combined parents or parenting (e.g., parent–child relations, parenting style, caregiving practice, mother, father) and obesity (e.g., obesity, body weight, overweight) or obesity-related lifestyle behaviors (e.g., food intake, snacking, sweetened beverages, physical activity, outdoor play, exercise, media use, video games) and searched title, abstract, and Medical Subject Headings term fields. We limited searches to populations aged 0 to 18 years. The final database search was conducted in December 2015.

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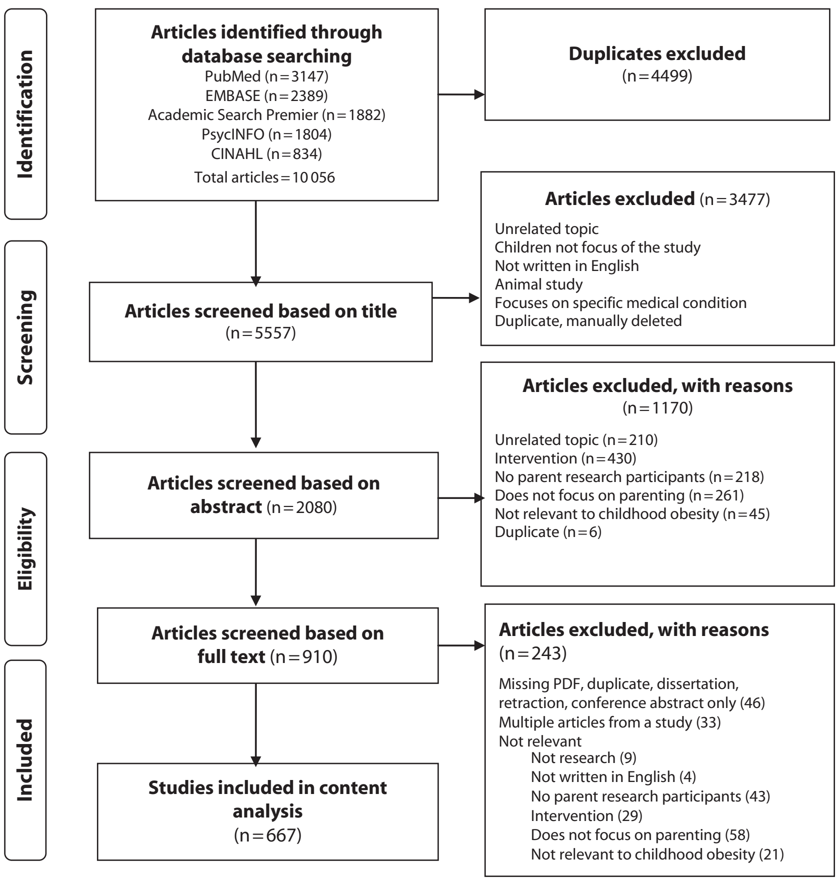

FIGURE 1—Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flow Diagram Summarizing Search Process to Identify and Screen Eligible Studies on Parenting and Childhood Obesity Published Between 2009 and 2015

As summarized in Figure 1, we identified a total of 5557 unique studies after the removal of 4499 duplicates. Following a screen of study titles, we reduced the article pool to 2080 studies.

Application of Eligibility Criteria

Two coders screened the abstracts of the remaining studies and applied the eligibility criteria. Inclusion criteria included observational studies published between January 2009 and December 2015 that examined links between parenting and childhood obesity, included parents or caregivers as research participants, and were written in English. Exclusion criteria included intervention studies, animal or nonhuman studies, and studies on youths with specific medical conditions (e.g., spina bifida, mental illness, type 2 diabetes). We also excluded dissertations and conference abstracts. Interventions were not eligible for this study because they are inherently different from observational studies and require a different coding scheme; interventions will be the subject of a separate review and content analysis. We excluded studies focused on youths with specific medical conditions because they cannot be readily applied to the general population of children. In most instances, such studies were also interventions. Therefore, a focus on youths with medical conditions was generally 1 of a number of reasons they were ineligible. We limited our search to studies published since 2009 to ensure the feasibility of this review because of the large volume of articles identified. Finally, we excluded dissertations and abstracts because they were not relevant to the current study, which focused on the representation of fathers in published childhood obesity studies.

During the abstract review process, we removed 1170 studies that did not meet the eligibility criteria resulting in 910 studies considered for full-text coding. We removed an additional 243 studies during full-text coding because they did not meet eligibility criteria or could not be located. Consistent with systematic review guidelines,[25] we included only 1 article per study in the analysis. When multiple articles from the same study were identified, we included the first published article. Following all screening procedures, the final sample included 667 eligible studies.

Content Analysis of Eligible Studies

We used quantitative content analysis to code eligible studies by using methods similar to those used in previous studies.[26,27] Content analysis involves the systematic and replicable analysis of messages and can be used to systematically document study information.[24] Four coders were trained to code the studies with a comprehensive code book to standardize coding procedures. We established intercoder reliability[28] (see "Intercoder Reliability" section) before coding the full sample of studies. For each study, we coded more than 90 study and parent or caregiver characteristics. A detailed description of the coding categories is provided in Gicevic et al.[19] Our description focuses only on the variables included in this analysis.

For study characteristics, we coded publication year, geographic region of the study, journal, study focus, and child age group. We coded study focus (e.g., diet, physical activity, screen or media use, sleep, obesity) on the basis of on the study title. For example, we coded a study as focusing on diet if any diet-related term (e.g., child feeding, family meals, food insecurity) was included in the title. If a study title included an obesity-related term (e.g., weight status) but did not list a behavioral construct, we coded it as "obesity." Child age groups included 0 to 1 year, 2 to 5 years, 6 to 10 years, 11 to 13 years, and 14 to 17 years, which correspond approximately to infants, preschool, elementary-school, middle-school, and high-school ages, respectively. For study focus and child age, multiple categories could be selected.

For parent or caregiver characteristics, we coded the number of parent research participants, parent gender, whether parents from disadvantaged groups (i.e., low socioeconomic status [SES], racial/ethnic minority, recipient of federal income or food assistance) were targeted during recruitment, parent relationship with the target child (i.e., biological relationship, residential status), and household structure (i.e., single-parent, dual-parent household).

For parent gender, we coded whether an article included mothers or female caregivers, fathers or male caregivers, mothers and fathers, or did not mention parent gender. In cases in which mothers and fathers were included, we coded whether the results were aggregated across parent gender or presented separately for mothers and fathers. We coded studies as targeting parents from racial/ethnic minority groups if any of the following groups were referenced in the Methods section—Black or African American, Hispanic, Asian American, an Indigenous group (Native American, Pacific Islander, or Native Canadian)—or if the article explicitly referred to the recruitment of a racial/ethnic minority sample. We coded low SES on the basis of article self-definition (i.e., the sample was described within the study as low-SES, low-income, or low-education). If the study was housed within an income-eligible program (e.g., the Special Supplemental Nutrition Program for Women, Infants, and Children) we automatically coded it as low SES. We coded parent biological status (biological, nonbiological), residential status (residential, nonresidential), and household structure (single-parent households including nonmarried, divorced, separated, and widowed parents; dual-parent households including cohabiting and married parents) on the basis of the sample description in the text or information provided in the tables.

Intercoder Reliability

To establish intercoder reliability, we selected approximately 10% of studies ($n = 59$ studies) at random from eligible studies and all coders coded them by using the standardized codebook. We used Krippendorff's α (k-α) to calculate intercoder reliability; k-α accounts for chance agreement and is applicable with any number of coders and for any level of measurement (i.e., nominal, ordinal, interval, ratio variables).[29]

Across all coded variables, the average k-α score was 0.79 and the average simple percentage agreement was 94%. We considered variables with a minimum k-α of 0.70 to have adequate intercoder reliability and we included these in the analyses.[30] In some cases, variables with low variation, which results when study or participant characteristics occur infrequently, had a k-α of less than 0.70 but high simple agreement (> 90%). We also included these variables in the analyses given that reliability coefficients that account for agreement by chance, such as k-α, are difficult to interpret when variability is low.[31–33] We included 2 variables (single parent, parent from indigenous group) in the analyses under these circumstances.

Data Analysis

We conducted analyses with SAS version 9 (SAS Institute, Cary, NC). We imputed missing data on a case-by-case basis. Missing data were typically the result of skip patterns in the online coding form used to streamline the coding process and could be justifiably recoded as "0" (no or not sure). For example, when mothers or fathers were not included in a study, the coders were not prompted to code the sample size for that group. In such cases, the number of participant mothers or fathers was coded as "0" during the data-cleaning process. For missing data that were not the result of skip patterns, one of the authors returned to the original article and retrieved the missing information; we identified and coded a total of 33 such missing data points, out of more than 60 000 data points, in this manner.

The unit of analysis and the denominator vary by research question. In all tables, the specific denominator for each calculation is indicated in the footnotes. In Tables 1 and 2, "study" is the unit of analysis and the denominator is the total number of studies (i.e., 667). In Table 3, "participant" is the unit of analysis and the denominator is the total number of relevant studies (i.e., all studies or studies with 1000 or fewer participants). Here, we conducted an independent *t* test to examine differences in the mean sample size per study for mothers and fathers (Table 3). In Table 4, "study" is the unit of analysis and the total number of relevant studies (i.e., studies that included fathers or did not include fathers) is the denominator. We used a χ^2 trend test (Cochran–Armitage trend test) to test the time trend in fathers' inclusion in studies by study year; we also calculated Somers' D (C D) to illustrate strength of association. We used χ^2 analysis to test differences in background characteristics of studies that did and did not include fathers; we output odds ratios (ORs) and 95% confidence intervals (CIs) with each analysis to demonstrate direction and strength of association.

RESULTS

The number of eligible studies ranged from 80 to 140 studies each year, with the exception of 2009, which included 46 eligible studies (Table 1). More than 80% of studies originated from the United States; Europe or the United Kingdom; or Australia, New Zealand, or Papua New Guinea. Only 6% of eligible studies originated from Asia, Central or South America, or the Middle East. Studies were published in more than 190 journals. The 2 predominant journals, publishing 23% of the studies, were *Appetite* and the *International Journal of Behavioral Nutrition and Physical Activity*. Although all child age groups were represented, the majority of studies included parents with children aged 2 to 5 years or 6 to 10 years.

Table 2 summarizes the representation of fathers in studies. Thirty-six percent of all eligible studies included only mothers. In contrast, 1% of eligible studies included only fathers. Despite slightly more than half of eligible studies including at least 1 father ($n = 340$), only 57 of these studies reported results for fathers separate from mothers; the vast majority of studies that included mothers and fathers collapsed the results across parent gender and presented findings for "parents." In total, 10% of all eligible studies included fathers as research participants and presented independent results for fathers.

When fathers were included in a study, they generally made up a small minority of parent participants. More than 25% of studies with mothers had a sample size of more than 500 mothers, whereas only 10% of studies that included fathers had a sample of more than

TABLE 1—Characteristics of Eligible Studies on Parenting and Childhood Obesity Published Between 2009 and 2015

Characteristic	Studies, No. (%)[a]
Year of publication	
2009	46 (8)
2010	86 (17)
2011	104 (20)
2012	95 (19)
2013	113 (21)
2014	135 (15)
2015	88 (13)
Geographic region	
United States	325 (49)
Europe or United Kingdom	166 (25)
Australia, New Zealand, or Papua New Guinea	101 (15)
Canada	24 (4)
Asia	20 (3)
Mexico or Central America	7 (1)
South America	7 (1)
Middle East	5 (1)
Other, includes Israel, Caribbean, Africa	12 (2)
Journal, > 10 studies	
Appetite	101 (15)
International Journal of Behavioral Nutrition and Physical Activity	55 (8)
Public Health Nutrition	26 (4)
Journal of Nutrition Education and Behavior	25 (4)
BMC Public Health	21 (3)
Journal of the American Dietetic Association	16 (2)
International Journal of Pediatric Obesity	13 (2)
Preventive Medicine	13 (2)
Child age group targeted[b]	
0–1 y, infants	60 (9)
2–5 y, preschool	295 (44)
6–10 y, elementary school	281 (42)
11–13 y, middle school	206 (31)
14–17 y, high school	90 (13)
Not specified	44 (7)

[a]Denominator for % of studies = all eligible studies (n = 667).
[b]Percentages may add to more than 100 because groups are not mutually exclusive.

500 fathers (Table 2). The total number of mothers and fathers included as participants across all relevant studies along with the mean number of mothers and fathers per study is presented in Table 3. Across all studies, the mean sample size for fathers (139.1; SD = 780.6) was significantly smaller than for mothers (672.2; SD = 2979.5). When we removed studies with more than 1000 parent participants from the analysis because of their disproportionate effect on the results, fathers continued to have a significantly lower mean sample size (28.2; SD = 72.9) than mothers (176.1; SD = 215.1). Across all studies, a total of 17% of all parent participants were fathers.

Table 4 presents characteristics of studies that included any fathers compared with studies that did not include fathers along with the results of χ^2 analyses testing group differences. Fifty-two percent of all eligible studies included at least 1 father; this pattern was similar by study year (χ^2 trend test $z = 0.96$; Somers' D (C D) = −0.04; 95% CI = −0.12, 0.04). Compared with studies that did not include fathers, significantly fewer studies that included fathers focused on diet (51% vs 64%) and significantly more studies with fathers focused on physical activity (29% vs 17%). Furthermore, compared with studies that did not include fathers, significantly fewer studies that included fathers targeted families of low SES (14% vs 25%), families from racial/ethnic minority groups (19% vs 35%), or families receiving federal income or food assistance (17% vs 27%) and significantly more studies included nonbiological (14% vs 11%) or nonresidential (2% vs 0%) parents. Finally, compared with studies that did not include fathers, significantly fewer studies with fathers focused on families with infants (5% vs 13%) or preschool-aged children (35% vs 54%), and significantly more studies focused on families with children in middle school (38% vs 24%) or high school (19% vs 8%). We observed no significant differences in household structure.

DISCUSSION

This study provides a systematic review and quantitative content analysis of fathers' representation in observational studies on parenting and childhood obesity published between 2009 and 2015. We used rigorous, transparent, and replicable research methods, and found that fathers were substantially underrepresented compared with mothers. In our analysis of more than 600 studies, only 1% of studies included only fathers; in comparison, 36% of studies included only mothers. Although slightly more than 50% of studies included mothers and fathers, only 57 of these studies reported results for fathers separately from mothers. In total, 10% of all eligible studies included independent results for fathers, which likely reflects the small numbers of fathers included in studies. In addition to fathers' general underrepresentation, we observed biases in the topics addressed and the characteristics of the parents recruited for studies with and without fathers.

TABLE 2—Representation of Fathers, Compared With Mothers, in Research on Parenting and Childhood Obesity Published Between 2009 and 2015

Variable	Studies, No. (%)
Gender of parent participants[a]	
Mothers only	244 (36)
Fathers only	8 (1)
Mothers and fathers	340 (51)
Results disaggregated for fathers (% of all studies)	57 (9)
Not specified	75 (11)
Sample sizes for mothers[b]	
1–10	8 (1)
11–50	113 (21)
51–200	150 (29)
201–500	115 (22)
501–1000	68 (13)
1001–5000	55 (10)
≥ 5001	15 (3)
Sample sizes for fathers[c]	
1–10	87 (29)
11–50	91 (30)
51–200	72 (24)
201–500	22 (7)
501–1000	10 (3)
1001–5000	18 (6)
≥ 5001	4 (1)

[a]Denominator for % of studies = all eligible studies (n = 667).
[b]Denominator for % of studies = studies that included mothers and the number of mothers is known (n = 524).
[c]Denominator for % of studies = studies that included fathers and the number of fathers is known (n = 304).

TABLE 3—Total and Average Number of Mothers and Fathers Across All Studies and for Studies With 1000 or Fewer Participants From Research Published Between 2009 and 2015

Variable	Studies, No.	Total Participants Summed Across Studies, No.	No. of Participants per Study, Mean (SD)	Mean Difference (95% CI)	t
All studies					
Fathers	667	92 778	139.1 (780.6)[a,b]	−532.9 (−766.6, −299.2)	−4.47***
Mothers	667	448 336	672.2 (2979.5)[a,b]		
Studies with n ≤ 1000					
Fathers	549	15 464	28.2 (72.9)[c]	−147.9 (−166.9, −128.9)	−15.26***
Mothers	549	96 694	176.1 (215.1)[c]		

Note. CI = confidence interval.
[a]Large standard deviations can be explained by a small number of studies with a very large sample size (e.g., > 40 000). For this reason, we ran a second analysis excluding studies with a sample size larger than 1000.
[b]Denominator for mean = 667 studies.
[c]Denominator for mean = 549 studies.
****P* < .001.

Compared with studies that did not include fathers, studies that included fathers were less likely to focus on diet and less likely to include fathers of young children (aged < 5 years) or to target underserved populations during recruitment (i.e., low-SES families, racial/ethnic minority groups, and recipients of federal assistance programs).

Results from this study are consistent with previous studies by Phares. In a 1992 review of 577 studies on child psychopathology, Phares[34] found that 1% of studies included fathers only, compared with 48% of studies that included mothers only. Although more than 50% of studies included mothers and fathers, only 26% of studies reported results for fathers separate from mothers. When Phares et al. repeated this analysis in 2005, similar levels of father representation, or underrepresentation, were observed despite the 13-year lag.[14] We conducted our review of the representation of fathers in observational childhood obesity studies 10 years later, yet the representation of fathers in our analysis was even more problematic than that noted by Phares et al. We found that 10% of all eligible studies presented independent results for fathers, whereas Phares found that approximately 27% of eligible studies reported independent results for fathers.[14,34] This discrepancy may be explained by the fact that approximately half of the studies in our analysis focused on links between parenting and children's nutrition, which has historically been the domain of mothers.

Fathers' underrepresentation in childhood obesity research has significant public health implications. First, it means that there is a lack of relevant scientific information on the effect of fathers on children's obesity-related behaviors. This is particularly the case for fathers from low-SES and racial/ethnic minority groups, who are at increased risk for obesity.[35] The lack of information on fathers has implications for the design and conduct of family interventions targeting childhood obesity. The behavioral targets and intervention strategies adopted in contemporary family interventions are likely to be based on data from mothers. The absence of intervention strategies tailored to fathers may dissuade fathers from participating in childhood obesity prevention and treatment programs. This in turn may limit program efficacy given that active participation of multiple family members in child health programs has been shown to enhance intervention efficacy.[36,37]

In addition to promoting the inclusion of fathers in future research, lessons learned from this study can be used to support the scientific rigor and transparency of future studies with fathers. Determining whether fathers were included in studies was not a straightforward task because of the ambiguity of reporting. In our analysis, 11% of studies did not specify the gender of the parent participants and referred only to "parents." Phares noted a similar lack of reporting of parent gender.[14] Moreover, 36% of the studies included no information on the biological, residential, or marital status of parents. Given the diversity of contemporary family structures[38] and the lack of information in general on the role of nonbiological and nonresidential parents on child health outcomes, providing detailed demographic information on the parent participants in future research is critical.

Although there are clear implications of this research, they need to be considered against this study's limitations. First, we focused on studies published over a relatively narrow time period. We adopted this strategy to ensure that it was feasible to rigorously code the studies identified. Even with this time restriction, we screened more than 5000 studies and included 667 studies in our final sample. Rather than limiting the study timeframe, we could have limited the analysis to studies published in a select number of relevant journals, a strategy used in previous content analyses of published research.[39,40] We rejected this strategy, however, as we were concerned it would introduce systematic bias into the sample because of the broad range of journals in which studies on parenting and childhood obesity are published. Although the use of a 7-year window may have limited our ability to identify time trends in father representation, this was not a focus of the study.

A second limitation is that we did not search the gray literature as is commonly recommended in systematic reviews.[25] Documenting intervention efficacy or the relationship between 2 constructs (e.g., effect of food parenting on children's dietary intake) was not an objective of this study. As a result, the gray literature was not relevant for this review. Instead, our goal was to assess the representation of fathers in published research as published research will likely drive program development. There is no obvious reason why unpublished studies would differ systematically in the inclusion of fathers compared with published studies; thus, it is unlikely that this decision affects the validity of our conclusions.

Third, we did not assess risk of bias in studies. As with the gray literature, study bias was not relevant for the present study

TABLE 4—Characteristics of Studies on Parenting and Childhood Obesity Published Between 2009 and 2015 That Included and Did Not Include Fathers as Research Participants

Variable	Studies That Included Any Fathers (n = 348), No. (%)[a]	Studies That Did Not Include Fathers (n = 319), No. (%)[b]	χ^2	OR (95% CI)
Year of publication				
2009	24 (7)	22 (7)	0.96[c]	
2010	49 (14)	37 (12)		
2011	57 (16)	47 (15)		
2012	48 (14)	47 (15)		
2013	55 (16)	58 (18)		
2014	74 (21)	61 (19)		
2015	41 (12)	47 (15)		
Study focus, based on study title[d]				
Diet	177 (51)	203 (64)	11.08**	0.59 (0.43, 0.81)
Physical activity	99 (29)	54 (17)	12.8***	1.95 (1.34, 2.85)
Screen or media behavior	44 (13)	36 (11)	0.29	1.14 (0.72, 1.81)
Obesity	60 (17)	49 (15)	0.43	1.14 (0.76, 1.73)
Disadvantaged groups targeted in recruitment				
Low SES, income, or education	50 (14)	80 (25)	12.2***	0.50 (0.33, 0.74)
Racial/ethnic minority, US only[e]	33 (19)	52 (35)	10.5**	0.43 (0.26, 0.73)
Federal income or food assistance, US only[e]	29 (17)	40 (27)	4.9*	0.55 (0.32, 0.94)
Child age group targeted[d]				
0–1 y, infants	85 (5)	42 (13)	13.0***	0.36 (0.20, 0.64)
2–5 y, preschool	123 (35)	172 (54)	23.3***	0.46 (0.34, 0.64)
6–10 y, elementary school	148 (43)	133 (42)	0.04	1.03 (0.76, 1.41)
11–13 y, middle school	131 (38)	75 (24)	15.6***	1.96 (1.40, 2.75)
14–17 y, high school	66 (19)	24 (8)	18.7***	2.88 (1.75, 4.72)
Biological relationship with child				
Biological	47 (14)	42 (13)	0.01	1.02 (0.65, 1.61)
Nonbiological	22 (6)	7 (2)	6.8**	3.00 (1.27, 7.14)
Residential status of parents				
Residential	47 (14)	35 (11)	0.99	1.26 (0.79, 2.02)
Nonresidential	7 (2)	0 (0)	6.5*	1.02 (1.01, 1.03)
Household structure				
Dual-parent households[f]	135 (39)	122 (38)	0.02	1.02 (0.74, 1.40)
Single parents[g]	81 (23)	84 (26)	0.84	0.84 (0.60, 1.21)

Note. CI = confidence interval; OR = odds ratio; SES = socioeconomic status.

[a]Denominator for % of studies = 348.

[b]Denominator for % of studies = 319.

[c]*z*-score from χ^2 trend test.

[d]Percentages may add to more than 100 because groups are not mutually exclusive.

[e]Reporting of ethnic minority groups and recipients of federal income programs are limited to US studies that included fathers (n = 175) and US studies that did not include fathers (n = 150) as this information was rarely reported in non-US studies.

[f]Includes families in which caregivers were classified as "married" and "cohabiting."

[g]Includes families described as "unmarried" or "divorced/separated."

*$P<.05$; **$P<.01$; ***$P<.001$.

because of our focus on study participants rather than the study findings.

Notwithstanding these limitations, this study makes a number of important contributions. Although most obesity researchers would agree that fathers are underrepresented in child health research, little has been done to rectify this problem. This study provides clear quantitative evidence of fathers' underrepresentation in observational studies on parenting and childhood obesity. It also provides recommendations to advance the study of obesity and the reporting of participant characteristics and study findings. The limited inclusion of fathers in childhood obesity research is a missed opportunity to improve the corpus of childhood obesity knowledge and potential interventions. It is our hope that quantifying the extent of fathers' underrepresentation will bring attention to this issue and serve as an impetus for change. Such change could be recognized through strategies such as targeted funding announcements and journal supplements focused on fathers to expand the literature base on fathers and facilitate more inclusive, family-focused approaches to childhood obesity prevention. AJPH

CONTRIBUTORS

K. K. Davison conceptualized and designed the study, participated in the development of the coding scheme, coded the studies, analyzed the data, and drafted the article. S. Gicevic led article identification and extraction, participated in the development of the coding scheme, coded the studies, assisted with data analysis, and reviewed and revised the article for critical content. A. Aftosmes-Tobio participated in the development of the coding scheme, developed the online coding tool, coded the studies, tracked coding progress, led coding review, assisted with data analysis, and reviewed and revised the article for critical content. C. Ganter and C. L. Simon participated in the development of the coding scheme, coded the studies, and reviewed and revised the article for critical content. S. Newlan calculated all κ statistics, participated in data analysis, and reviewed and revised the article for critical content. J. A. Manganello conceptualized and designed the study, participated in the development of the coding scheme, and reviewed and revised the article for critical content. All authors approved the final article as submitted.

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HUMAN PARTICIPANT PROTECTION

Human participant review was not required because the research did not include any human participants.

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