

Analysis of Childhood Obesity in Alabama and Delaware: A Cohort Study

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How to cite this paper: Muomah, O.M. (2021) Analysis of Childhood Obesity in Alabama and Delaware: A Cohort Study. *Open Journal of Pediatrics*, 11, 570-579. <https://doi.org/10.4236/ojped.2021.114053>

Received: September 25, 2021

Accepted: October 25, 2021

Published: October 28, 2021

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Abstract

Objective: The objective is to evaluate data sets for children aged 24 to 59 months that identified the risk factors of being obese and overweight and compare it between two U.S. states (Alabama and Delaware). **Methods:** An analysis of survey data sets published between 2013 and 2017, comparing the factors of obesity and its prevalence amongst different races of 50,760 children aged 24 to 59 months in the U.S., was conducted using Microsoft Excel 2016 and IBM SPSS version 1.0.0. **Results:** Hispanic children have the highest rate of obesity in the U.S compared to all other races. Children aged 2 - 4 years old from Alabama were more at risk for being overweight and obese compared to those from Delaware. Those between the ages of 48 - 59 months of age were more at risk than the other age groups. **Conclusions:** Childhood obesity is a predisposing factor for adult obesity. There is a need to identify the risk factors of obesity early in a person's life and address them appropriately.

Keywords

Obesity, Overweight, Hispanics, Children, Body Mass Index, Analysis

1. Background

One of the health issues facing the world, more specifically the U.S., is obesity. This health issue is more prevalent in minority populations including non-Hispanic black and Hispanic children and adolescents than in their Caucasian counterparts [1]. Studies show that one in six U.S children and teens are obese [2]. Childhood obesity is also one of the major contributors to adult obesity. According to CDC, obesity is defined as an excess in body fat, with a BMI at or above the 95th percentile for children and teens of the same age and sex [3]. Some of the tools and techniques used to effectively measure body fat and BMI

include underwater weighing (densitometry), multi-frequency bioelectrical impedance analysis (BIA), magnetic resonance imaging (MRI), waist circumference, and skin-fold thickness [4]. Worldwide, factors such as the environment that one grows up in, lifestyle preferences and culture play an important role in the rising prevalence of obesity [4].

One's diet habits play a huge role as well. A source mentions that a poor-quality diet that consists of high-calorie foods lacking the necessary micronutrients needed for optimal neurobehavioral development and growth can contribute to the issue of obesity and cause severe diet-related chronic diseases and deficits in learning capacities [5]. If nothing is done about this health issue, the child is at risk for developing chronic diseases later in life. The hypothesis of this research is to examine the contributing factors to childhood obesity in Hispanic children in the U.S., compared to other populations. For children living in the United States, other contributing factors to obesity are family income level, parent's educational level, geographical location, and immigration status. To reduce the prevalence of childhood obesity, several evidence-based public health strategies have been put in place. This includes, promoting breastfeeding, limiting screen time, encouraging physical activity, increasing fruit and vegetable consumption, regulating portion size, and limiting the intake of sugar-sweetened beverages [6].

2. Methods

The dataset used for this study is titled, the Nutrition, Physical Activity, and Obesity—Women, Infant, and Child. It includes data on the weight status for young children aged 3 months to 4 years old from Women, Infant, and Children Participant and Program Characteristics (WIC-PC). WIC is a program put in place by the Food and Nutrition Service of the U.S. Department of Agriculture (USDA) to provide a combination of direct nutritional supplementation, nutrition education and counseling, and increased access to health care and social service providers for pregnant, breastfeeding, and postpartum women; infants; and children up to age five [7].

Data was collected between the time periods of 2008 to 2014 for all states in the U.S. To determine the child's weight status, questions such as percent of WIC children aged 2 to 4 years who have an overweight classification, percent of WIC children aged 2 to 4 years who have obesity, and percent of WIC children aged 3 - 23 months old who have a high weight-for-length was asked. Variables such as sample size, low and high confidence intervals, were all calculated.

An analysis of the survey data sets across the different states in the U.S. comparing the risk factors of being overweight and obese and its prevalence amongst different races of children aged 24 months to 59 months old in the U.S, was done using Microsoft Excel 2016. Birth dates were used to calculate age. Children were assigned to a weight status category of overweight ($BMI \geq 85^{\text{th}}$ percentile and $<95^{\text{th}}$ percentile) or obese ($\geq 95^{\text{th}}$ percentile) based on CDC growth chart criteria.

Analysis was done for two U.S. states with a higher prevalence of childhood obesity in Alabama and Delaware. Variables such as age, gender, and race were analyzed. A clustered column was then created to interpret the individual data sets and represent the figures. 50,760 children aged 24 months to 59 months in two different U.S states were a part of this study. For the states of Alabama and Delaware, the 2014 data was used. Using IBM SPSS version 1.0.0, a Chi-square test was conducted to show statistical significance between all identified variables.

3. Results

Hispanic children have the highest rate of obesity in the U.S compared to all other races. Children aged 2 - 4 years old from Alabama were more at risk for being overweight and obese compared to those from Delaware. Those between 48 - 59 months of age were more at risk than the other age groups. Confidence Intervals were also included to show significance.

As identified in **Table 1** which shows the 2014 demographic characteristics of children with obesity in Alabama and Delaware, an analysis of 43,509 children from Alabama were classified as being either obese or overweight. Comparison done for the different age groups show that age plays a large role in childhood obesity with age group 48 to 59 months having a higher percentage of overweight (17.6%) and obese (18.6%) children when compared to other age groups ranging from 24 - 47 months. Gender was not a precursor for childhood obesity as identified by the ratio of obese males and females. The race was found to be a contributing factor to childhood obesity with 20.3% of Hispanic children being overweight, while 25.2% were obese, a much higher percentage when compared to other races, as identified in **Figure 1**. In total, 16.5 percent of children in Alabama were found to be overweight compared to 16.3 percent who were found to be obese.

In the state of Delaware, 7251 children were classified as being either obese or overweight. As identified in **Figure 2**, comparison done for the different age groups show that age plays a large role in childhood obesity with age group 48 to 59 months having a higher percentage of overweight (16.3%) and obese (21.6%) children when compared to other age groups ranging from 24 - 47 months. Gender was not a precursor for childhood obesity as identified by the ratio of obese males and females. The race was found to be a contributing factor to childhood obesity with 25.9% of Hispanic children being overweight, while 24.2% were obese, a much higher percentage when compared to other races. There was no identified data on American Indian/Alaska children who were obese or overweight. In total, 16.2 percent of children in Delaware were found to be overweight compared to 17.2 percent who were found to be obese.

To show statistical significance, a chi-square test was conducted to test which variable(s) was directly associated with childhood obesity. The variables tested were age, gender, and race. As shown in **Table 2**, $\chi^2(8.727) > df(5.99)$ proved that age was statistically significant and is directly associated with one's weight; $\chi^2(0.03599) < df(3.84)$ proved that gender was not statistically significant and

Table 1. 2014 demographic characteristics of children with obesity in two U.S. states.

STATES	Obese (%)	Low CI	High CI	Overweight (%)	Low CI	High CI
ALABAMA (n = 43,509)						
Age (months)						
24 - >35	14.2	13.7	14.7	16	15.5	16.6
36 - >47	17	16.4	17.6	16.3	15.7	16.9
48 - >59	18.6	17.8	19.3	17.6	16.9	8.3
Gender						
Male	15.5	15.1	16	16.6	16.1	17.1
Female	17	16.5	17.5	16.5	16	17
Race						
Asian/Pacific Islander	7.3	4.3	10.3	11.5	7.8	15.2
American Indian/Alaska Native	13.8	10.4	17.3	14.6	11.1	18.2
Non-Hispanic Black	14	13.5	14.5	15	14.5	15.5
Non-Hispanic White	15.1	14.6	15.6	16.6	16.1	17.2
Hispanic	25.2	24.2	26.2	20.3	19.4	21.3
DELAWARE (n = 7251)						
Age (months)						
24 - >35	14.3	13.1	15.6	16.3	15	17.6
36 - >47	18.5	17.1	19.9	15.9	14.6	17.3
48 - >59	21.6	19.2	23.9	16.3	14.2	18.4
Gender						
Male	17.8	16.6	9	16.6	15.4	17.8
Female	16.5	15.3	7.8	15.7	14.5	16.9
Race						
Asian/Pacific Islander	10	5	15	7.9	3.3	12.4
American Indian/Alaska Native	0	0	0	0	0	0
Non-Hispanic Black	12.9	11.7	14.2	14.6	13.3	15.9
Non-Hispanic White	15.2	13.6	16.8	15.6	14	17.3
Hispanic	24.2	22.5	25.9	18.9	17.3	20.5

is not directly associated with one's weight; chi (143.204) > df (9.49) proved that race was statistically significant and is directly associated with one's weight.

4. Discussion

After comparison of data for both the states of Alabama and Delaware, the values show that being Hispanic is a strongly significant factor to being either overweight or obese when compared to other races. Hispanic children are more prone to being overweight/obese due to socioeconomic factors such as family

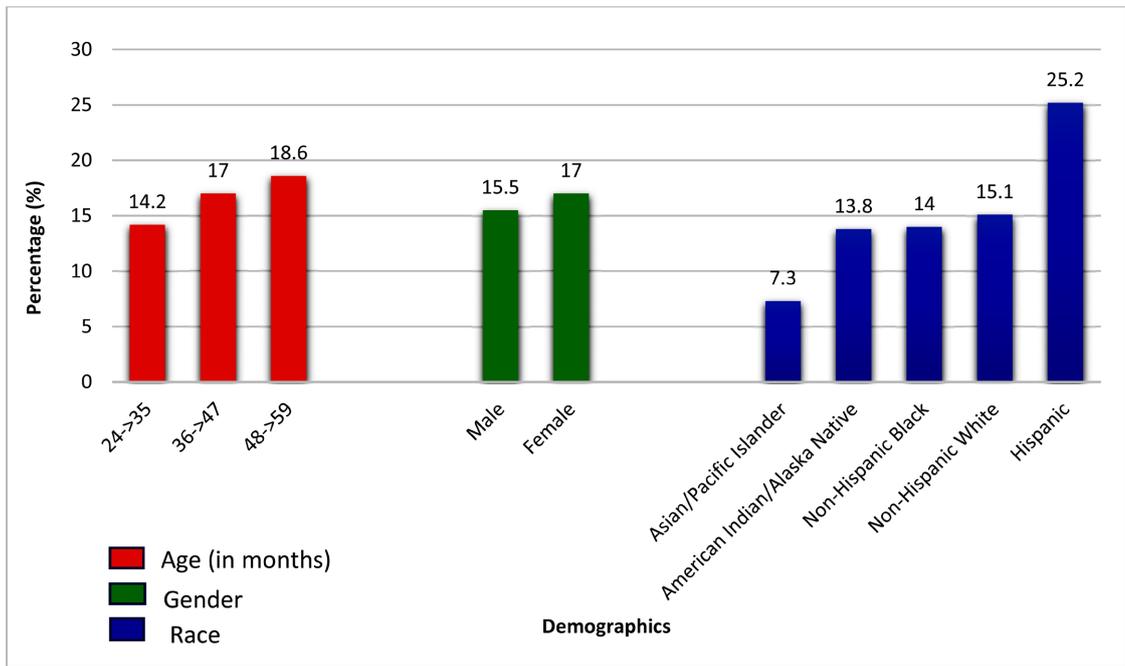


Figure 1. Demographic characteristics of childhood obesity in Alabama, 2014.

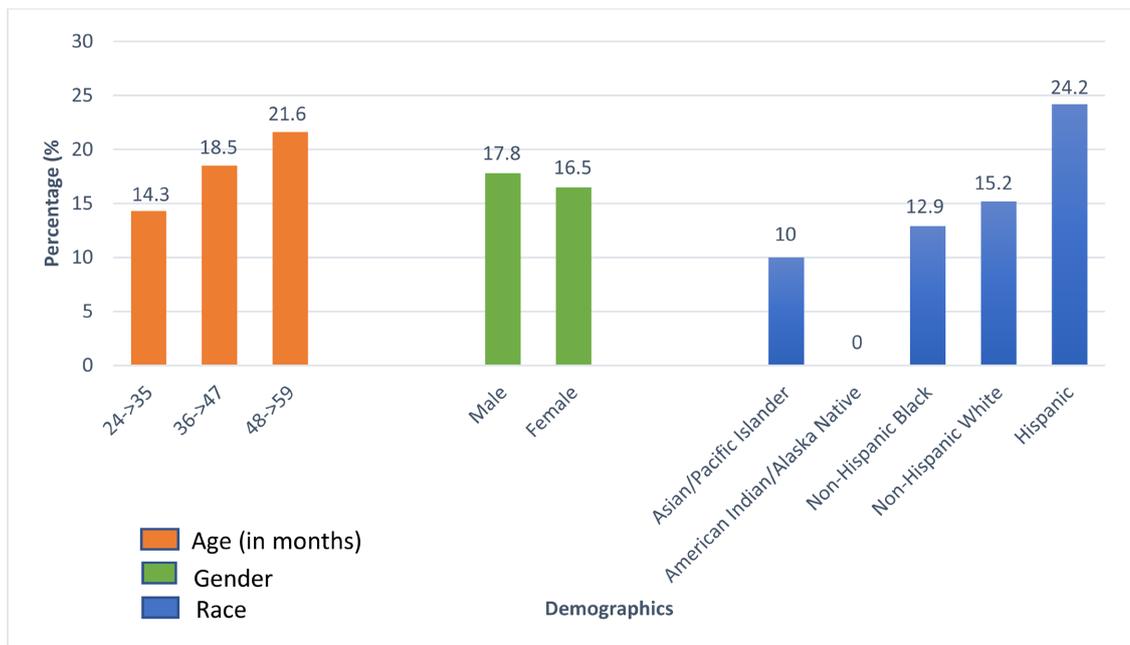


Figure 2. Demographic characteristics of childhood obesity in Delaware, 2014.

income level, educational level, geographical location, and immigration status. Additionally, the female populations are more predisposed to being overweight/obese when compared to the male population. Also, age is a factor because children who were between 48 months to 59 months showed more significance with a higher confidence interval than other age groups.

Some of the limitations to this study were missing data for some sample sizes/demographics, dataset irregularities/error (date appeared where age should),

Table 2. Statistical analysis between variables for children with obesity in two U.S. states.

CHI SQUARE TEST										
	Observed O	Observed OV	Row Total	Expected	Expected OV	Chi Square O	Chi Square OV	Chi	df	Interpretation
Age (months)										
24 - 35	14.2	16	30.2	15.085	26.437	0.519	4.120	8.727	2 = 5.99	Reject Ho if chi square > df Statistically Significant Age is directly associated with weight
36 -47	17	16.3	33.3	16.633	24.426	0.008	2.703			
48 - 59	18.6	17.6	36.2	18.082	24.261	0.015	1.829			
Column Total	49.8	49.9	99.7							
Gender										
Male	15.5	16.6	32.1	15.693	17.117	0.002	0.016	0.036	1 = 3.84	Do not reject Ho chi < df Not Statistically Significant Gender is not directly associated with weight
Female	17	16.5	33.5	16.493	16.303	0.016	0.002			
Column Total	32.5	33.1	65.6							
Race										
Asian/Pacific Islander	7.3	11.5	18.8	29.278	47.713	16.498	27.485	143.204	4 = 9.49	Reject Ho because chi square > df Statistically Significant Race is directly associated with weight
American Indian/ Alaska Native	13.8	14.6	28.4	36.638	40.099	14.236	16.214			
Non-Hispanic Black	14	15	29	36.4	40.345	13.785	15.922			
Non-Hispanic White	15.1	16.6	31.7	35.916	40.845	12.064	14.392			
Hispanic	25.2	20.3	45.5	41.76	34.8	6.567	6.042			
Column Total	75.4	78	153.4							

not enough risk factors represented, delay between data collection and reporting (the most recent published obesity rates from the NHANES are from 2013-2014). There was a lack of adequate data set to compare other risk factors associated with obesity in the Hispanic population.

The strengths of this study are that it included all the races of children in the United States. It examined a nationally representative sample of Americans ages 2 and older. It included a large sample size of children aged 3 months to 59 months from different races for six continuous years. It combines interviews with physical examinations, increasing the accuracy of the data.

Including other risk factors such as parent's educational level, immigrant generation, and household language would have further strengthened the study. Another limitation was the missing data for American Indians in the state of Delaware. Having a completion date for all races would have helped with a better comparison between the two (2) U.S. states.

5. Conclusions

In conclusion, being overweight is considered a risk factor for childhood obesity which could, in turn, lead to adult obesity later in life if contributing factors are not identified early enough. With the race being one of the predisposing factors,

one's culture does indeed influence the type of food eaten and portion size. Other identifying factors such as parental influence, genetics, and method of transportable also play a major role in a child's diet. This is because parents of children from a poor background might be too busy working and not have the luxury of time and money to buy or cook healthy foods often settling with just the fast-food option which is not as healthy. Genetics plays a major role in the weight of a child with several identified cases of children with parents/family members who were obese, hence, having a higher tendency of being overweight or obese themselves. Additionally, lack of transportation could negatively affect their food choices. It is certainly an issue because it limits the parent from easily accessing a grocery store; it also limits their access to educational nutritional programs [8].

What is already known on this topic

- Previous research shows that overweight kindergartners had four times the risk of becoming obese by the age of 14 years as normal-weight kindergartners [9].
- Another study revealed that breastfeeding was a protective factor against obesity, especially when given at the early stages of one's life.

What this study adds

- This study analyses predisposing factors such as age, gender, and race that contribute to childhood obesity.
- This study indicates that breastfeeding at 1 year of age was associated with a decreased weight percentile for age, body mass index percentile and z-score for age, and waist circumference below the 90th percentile [10].

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

- [1] Jun-Hyun, K., Chanam, L., Olvera, N. and Ellis, C. (2014) The Role of Landscape Spatial Patterns on Obesity in Hispanic Children Residing in Inner-City Neighborhoods. *Journal of Physical Activity and Health*, **11**, 1449-1457. <https://doi.org/10.1123/jpah.2012-0503>
- [2] Mejia de Grubb, M.C., Salemi, J.L., Kihlberg, C., Gonzalez, S., Zoorob, R. and Levine, R. (2017) Disparities in Accuracy of Maternal Perceptions of Obesity among Hispanic Children. *Journal of Health Care for the Poor and Underserved*, **28**, 1208-1221. <https://doi.org/10.1353/hpu.2017.0106>
- [3] Centers for Disease Control and Prevention (2007) Overweight and Obesity. Centers for Disease Control and Prevention. <https://www.cdc.gov/obesity/childhood/defining.html>, Accessed March 14, 2018.
- [4] Sahoo, K., Sahoo, B., Choudhury, A.K., Sofi, N.Y., Kumar, R. and Bhadoria, A.S. (2015) Childhood Obesity: Causes and Consequences. *Journal of Family Medicine and Primary Care*, **4**, 187-192.
- [5] Iriart, C., Boursaw, B., Rodrigues, G.P. and Handal, A.J. (2013) Obesity and Malnu-

- trition among Hispanic Children in the United States: Double Burden on Health Inequities. *Revista Panamericana de Salud Publica*, **34**, 235-243.
- [6] Knowlden, A.P. and Sharma, M. (2013) Systematic Review of School-Based Obesity Interventions Targeting African American and Hispanic children. *Journal of Health Care for the Poor and Underserved*, **24**, 1194-1214. <https://doi.org/10.1353/hpu.2013.0129>
- [7] Data.gov Catalog (2018) Nutrition, Physical Activity, and Obesity—Women, Infant, and Child. <https://catalog.data.gov/dataset/nutrition-physical-activity-and-obesity-women-infant-and-child>, April 2018, Accessed 2 May 2018.
- [8] Arauz Boudreau, A.D., Kurowski, D.S., Gonzalez, W.I., Dimond, M.A. and Oreskovic, N.M. (2013) Latino Families, Primary Care, and Childhood Obesity: A Randomized Controlled Trial. *American Journal of Preventive Medicine*, **44**, S247-S257. <https://doi.org/10.1016/j.amepre.2012.11.026>
- [9] Cunningham, S.A., Kramer, M.R. and Narayan, K.V. (2014) Incidence of Childhood Obesity in the United States. *The New England Journal of Medicine*, **370**, 403-411. <https://doi.org/10.1056/NEJMoal309753>
- [10] Verstraete, S.G., Heyman, M.B. and Wojcicki, J.M. (2014) Breastfeeding Offers Protection against Obesity in Children of Recently Immigrated Latina Women. *Journal of Community Health*, **39**, 480-486. <https://doi.org/10.1007/s10900-013-9781-y>

Annex. STROBE Statement—Checklist of Items

Item No	Recommendation	Page No	
Title and abstract 1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1	
	(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2	
Introduction			
Background/ rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	3, 4
Methods			
Study design	4	Present key elements of study design early in the paper	4, 5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4, 5
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	4, 5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4, 5
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses	4, 5 4, 5 4, 5 4, 5
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	5, 6 5, 6 5, 6
Descriptive data	14*	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest	5, 6 5, 6

Continued

		(c) <i>Cohort study</i> —Summarize follow-up time (e.g., average and total amount)	5, 6
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	5, 6
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	5, 6
Other analyses	17	Report other analyses done—e.g. analyses of subgroups and interactions, and sensitivity analyses	5, 6
Discussion			
Key results	18	Summarize key results with reference to study objectives	6, 7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	7
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	6, 7
Generalizability	21	Discuss the generalizability (external validity) of the study results	7, 8
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	1, 7