




Religiosity and Excess Weight Among African-American Adolescents: The Jackson Heart KIDS Study

Marino A. Bruce^{1,2,3,4}  · Bettina M. Beech^{3,4} · Tanganyika Wilder⁵ ·
E. Thomaseo Burton^{6,7} · Jylana L. Sheats⁸ · Keith C. Norris^{3,4,9} ·
Roland J. Thorpe Jr.^{3,4,10,11}

Published online: 16 January 2019

© Springer Science+Business Media, LLC, part of Springer Nature 2019

Abstract

Recent studies suggest that religion and spirituality can yield health benefits for young African-Americans. We examined the relationship between religious practices, spirituality, and excess weight among African-American adolescents ($N = 212$) residing in the Deep South. Results from modified Poisson regression analysis indicate that adolescents who prayed daily had a lower prevalence of excess weight (PR 0.77 [95% CI 0.62–0.96]) than those who did not. This relationship was only significant for 12–15 year-old participants in age-stratified analysis. These findings suggest that preventive interventions offered to children and younger adolescents can have implications for weight status across the lifespan.

Keywords Pediatric obesity · Religion · Spirituality · Health disparities · Population health

Introduction

Scholars have been interested in the relationship between faith-oriented factors and health for centuries. More recently, a growing segment of health scientists have begun to consider the implications of religion and spirituality (*R/S*) on physical health. While it is generally thought that *R/S* can be beneficial for an individual's overall health and well-being, results from recent studies have been mixed. The obesity literature, in particular, is exemplary in that some studies have found religiosity (i.e., the outward expression of social, doctrinal, and denominational links to organized religion) to be associated with lower obesity risk and prevalence (Cline and Ferraro 2006; Gillum 2006a, b; Koenig et al. 2012), whereas other studies have found religious practices to have no effect, or in some cases,

✉ Marino A. Bruce
marino.bruce@vanderbilt.edu

Extended author information available on the last page of the article

to be associated with an increased risk of obesity in adults (Dodor 2012; Feinstein et al. 2010; Ferraro 1998; Godbolt et al. 2017; Kim et al. 2003; Sack 2001). There are multiple explanations for these conflicting findings, including the use of imprecise concepts and contextually inappropriate measures of *R/S* that can confound results (Bruce et al. 2016, 2017b; Underwood and Teresi 2002).

Recent narrative and systematic reviews assert that new insights will emerge from studies that examine links between health outcomes and specific domains of religious or spiritual engagement as well as those that focus on populations for which the associations between faith-oriented factors and health appear to be salient (Maselko and Kubzansky 2006). Obesity can be an important focus area in the next generation of research linking *R/S* and health due to its increasing prevalence among diverse populations with strong faith-oriented attachments and beliefs. Weight reduction and weight gain prevention have been the focus of many health-based interventions that take place in religious settings (i.e., churches, mosques, temples) and incorporate religious tenants, or practices (Duru et al. 2010; Godbolt et al. 2017; Lancaster et al. 2014). This line of research underscores the importance of religious practices such as church attendance or prayer for adults; however, studies examining the relationship between faith-oriented factors and obesity-related outcomes in children and adolescents are scarce (Bruce et al. 2016; Dill 2017; Limbers et al. 2015).

African-Americans as a group have the strongest identification with, and attachment to, religious and spiritual communities (Godbolt et al. 2017; Pattillo-McCoy 1998; Pew Research Center 2009, 2016), as well as proportionately high risks of obesity and obesity-related diseases (e.g., hypertension, type-2 diabetes mellitus, chronic kidney disease, cardiovascular disease) (Bruce et al. 2013, 2017a; Norris and Nissenon 2008; Thorpe et al. 2014). Evidence from the National Study on Youth and Religion, a nationally representative longitudinal study of adolescents in the USA, indicates that religious and spiritual issues are important to this population as a majority of sample members indicate that they believe God and religion are important in their lives (Denton et al. 2008; Smith and Denton 2009; Smith et al. 2002). It has been suggested that *R/S* can promote well-being and protect adolescents from poor health (Bridges and Moore 2002; Dill 2017; Regnerus 2007; Regnerus et al. 2003). The bulk of these studies however focus on risky behaviors such as unprotected sex, alcohol consumption, and illicit drug use.

Obesity is a significant health concern, as the prevalence of obesity among 12–19-year-old individuals has quadrupled over the past 30 years (Ogden et al. 2014); and the upward trend for African-Americans adolescents has been even sharper. The adverse health impact of obesity is significant among young African-Americans given the elevated risks of the early onset and accelerated progression of chronic diseases among this group. It is important to determine whether *R/S* has implications for obesity among African-American children and adolescents, as there is an urgent need for culturally sensitive interventions designed to reduce disparities in the risks of obesity among African-American youth. The purpose of this study was to examine the relationship between religious practices, spirituality, and excess weight among a sample of African-American adolescents residing in the Deep South.

Methods

Data are from the Jackson Heart KIDS Pilot Study (JHS-KIDS), an observational examination of the development of obesity, metabolic and CVD-related risk factors among African-American adolescents in the greater Jackson, Mississippi area (Beech et al. 2017; Bruce et al. 2015, 2016, 2017a; Burton et al. 2017). Eligible participants were adolescents aged 12–19 years who were either children or grandchildren of individuals enrolled in the Jackson Heart Study (JHS), the largest epidemiological study of cardiovascular disease among African-Americans in the USA. After receiving approval from the University of Mississippi Medical Center Institutional Review Board, the research team used multiple methods to recruit participants through contact with JHS participants (Bruce et al. 2013; Beech et al. 2017). Interested parents or grandparents called the study phone number and answered screening questions to ensure eligibility. Two hundred and twelve adolescents and an accompanying parent or grandparent participated in the pilot study.

Adolescent participants had their blood pressure, height, and weight measured and were asked to complete self-administered surveys during the study visit. Blood pressure readings were obtained by trained staff with a random zero sphygmomanometer (Bruce et al. 2013). Participant surveys contained several psychosocial (i.e., religiosity/spirituality) and health behavior (i.e., nutrition, physical activity) measures. The parent/grandparent present at the study visit, regardless of their participation in the JHS, had their BP, height, and weight measured, and completed the Child Feeding Questionnaire if the child participant lived with them.

Study Variables

Outcome Variable

Excess weight was defined by weight status categories based on body mass index (BMI) cut points specified by the Childhood Obesity Working Group of the International Obesity Taskforce (Vidmar et al. 2004). Participant measured height and weight were used to calculate crude BMI ($\text{BMI} = \text{weight in kilograms} / \text{height in meters}^2$) and were collected using a Shorr Height Measuring Board and a Seca 770 Model scale, respectively. Two measurements were taken and averaged to ensure accuracy. The weight status categories were derived by transforming crude BMI to z scores using the lambda-mu-sigma (LMS) method, allowing for the development of smoothed growth using the curves and the efficient calculation of z scores simultaneously (Flegal and Cole 2013; Vidmar et al. 2004). Z scores were standardized to the reference population for participants' age and sex using the 2000 Centers for Disease Control and Prevention Growth Reference in the USA (Kuczmarski et al. 2002; Ogden et al. 2010). The two categories for 12–18 year-old study participants were normal weight ($\text{BMI} < 85\text{th percentile}$) and overweight or obese ($\text{BMI} \geq 85\text{th percentile}$). The two weight status categories for study participants aged 19 were normal weight ($\text{BMI} < 25$), overweight or obese ($\text{BMI} \geq 25$).

Key Independent Variables

The primary independent variables of interest were religious practice and spirituality. Religious practice was measured with two variables: weekly church attendance and daily prayer. Weekly church attendance was derived from the question, “In general, how often do you attend the main worship services of your church or otherwise participate in organizational religion (such as watching services on TV, listening to services on the radio, participating in Bible study groups, etc.)?” The response options ranged from “not at all” to “nearly every day.” Individuals with responses once per week, two or three times per week, or nearly every day were coded 1; all other responses were coded 0. Daily prayer was derived from the question, “Within your religious or spiritual tradition, how often do you pray privately or meditate in places other than at church, mosque, temple, or synagogue?” The response options for this item ranged from “never” to “more than one a day.” Individuals responding that they prayed once per day or more than once per day were coded 1; all other responses were coded 0.

Spirituality was measured by the short version of the Daily Spiritual Experience Scale (DSES) (Underwood and Teresi 2002). The DSES was developed to assess ordinary daily experiences rather than beliefs or behaviors (Fetzer Institute and National Institute on Aging Working Group 2003; Underwood and Teresi 2002). Six domains of the inner experiences with the transcendent were measured through statements assessing the frequency of the following experiences: (1) “I feel God’s presence,” (2) “I feel strength and comfort in my religious or spiritual tradition,” (3) “I feel deep inner peace and harmony,” (4) “I desire to be closer to or in union with God,” (5) “I feel God’s love for me, directly or through others,” and (6) “I am spiritually touched by the beauty of creation.” The response categories ranged from “never” (coded 0) to “many times a day” (coded 5). Responses were summed to create a composite score (range = 0–30). The Cronbach’s alpha for the DSES in this sample was 0.87.

Other Covariates

Weight management was represented by variables derived from two questions regarding attempts through diet and physical activity, respectively: (1) “Have you ever eaten less food, fewer calories, or food low in fat to lose weight or to keep from gaining weight?” and (2) “Have you ever exercised to lose weight or to keep from gaining weight?” “Yes” responses were coded “1,” and “no” responses were coded “0.” Sex was a dichotomous variable indicating whether respondents were female (coded 0) or male (coded 1). Age was also a dichotomous variable indicating whether participants were 12–15 (coded 0) or 16–19 (coded 1) years of age.

Statistical Approach

Percentages and mean and standard deviations were calculated to characterize the total sample. Chi-square and Student's *t* tests were performed to assess the proportional and mean differences by age for the variables in the study, respectively. Because the prevalence of obesity in the sample was greater than 10%, we conducted a modified Poisson regression with robust standard errors to estimate prevalence ratios (PR) and corresponding 95% confidence intervals (McNutt et al. 2003; Thorpe et al. 2017; Zou 2004). We estimated the relationship between excess weight and religious practice and spirituality for the total sample and by age. For all analyses, *p* values less than or equal to 0.05 were considered statistically significant. All statistical tests were two sided. All statistical analyses were completed using STATA statistical software, Version 15.

Results

The distribution of the select characteristics of African-American adolescents in the Jackson Heart Kids Pilot Study for the total sample and by age is displayed in Table 1. There were 212 adolescents in the sample, with approximately half being male (49.5%); and over half (53.8%) being overweight or obese. A large proportion of the adolescents engaged in religious practices: 55.2% reported daily prayer and 77.2% reported attending church weekly. Participants also reported a spirituality score of 18.7 ± 6.3 , suggesting that they, on average, have spiritual experiences most days. There were no significant age differences as it relates to any of the variables in the study.

Table 1 Distribution of characteristics of African-American adolescents in the Jackson Heart Kids Pilot Study for the total sample, and by age

Variable	Total sample <i>N</i> =212	Age		<i>p</i> value
		12–15 years old <i>N</i> =119	16–19 years old <i>N</i> =93	
Excess weight (%)	53.8	53.8	53.8	0.998
Male (%)	49.5	51.3	47.3	0.568
Age				
12–15 years old	56.1	–	–	
16–19 years old	43.9	–	–	
Manage weight through exercise (%)	74.5	78.2	69.9	0.171
Manage weight through diet (%)	48.6	47.1	50.5	0.615
Daily prayer (%)	55.2	54.6	55.9	0.851
Weekly church attendance (%)	72.6	76.5	67.7	0.157
Spirituality score (mean \pm SD)	18.7 ± 6.3	18.3 ± 6.2	19.3 ± 6.5	0.270

Excess weight was those adolescents who were overweight or obese

Table 2 Relationship between excess weight status and religiosity and spirituality among 212 African-American adolescents in the Jackson Heart Kids Pilot Study for the total sample, and by age

Variable	Total sample PR ^a (95% CI ^b)	12–15 years old PR ^a (95% CI ^b)	16–19 years old PR ^a (95% CI ^b)
Daily prayer	0.77 (0.62–0.96)	0.73 (0.54–0.97)	0.84 (0.61–1.15)
Weekly church attendance	1.24 (0.93–1.64)	1.41 (0.91–2.20)	1.08 (0.76–1.54)
Spirituality score	0.99 (0.98–1.01)	0.99 (0.96–1.02)	0.99 (0.97–1.02)

Models adjusted for age, male gender, manage weight through exercise, and manage weight through diet

^aPR prevalence ratio, ^bCI confidence interval

Adjusted prevalence ratios for the relationship between excess weight and religiosity and spirituality among African-American adolescents are shown in Table 2. Adjusted for age, male gender, and management of weight through exercise or diet, those African-American adolescents who reported praying daily had a lower prevalence of excess weight (PR 0.77 [95% CI 0.62–0.96]) than those who did not report praying daily. When examining this relationship by age, among African-American adolescents between the ages of 12 and 15, those who reported praying daily had a lower prevalence of excess weight (PR 0.73 [95% CI 0.54–0.97]) than those who did not report praying daily. Among those African-American adolescents between the ages of 16 and 19, there was no difference between those who reported praying daily and those who did not report praying daily in the prevalence of excess weight (PR 0.84 [95% CI 0.61–1.15]), and there was no association between report of spirituality and prevalence of excess weight PR 0.99 [95% CI 0.98–1.01].

Discussion

This study examined the association of *R/S* factors with excess weight in a sample of 212 adolescents who were descendants of Jackson Heart Study participants. We found that daily prayer was associated with a lower prevalence of the study participants being overweight or obese. This relationship varied by age as the inverse relationship between daily prayer and excess weight was statistically significant for 12–15 year-old sample members but not for older adolescents (16–19 year olds) in the study.

Our findings contribute to the evidence linking *R/S* with the enhanced well-being and overall positive outcomes of adolescents. Recent qualitative studies have found that prayer was an important religious and spiritual practice for African-American adolescents (Breland-Noble et al. 2015; Dill 2017). In these studies, prayer was a practice employed by youth to cope with stress emerging from personal circumstances, family affairs, peer conflicts, and community conditions (Breland-Noble et al. 2015; Dill 2017). Our study extends this line of research in that it examines how prayer can positively influence excess weight among African-American adolescents. Childhood obesity is a contributing factor in the development of chronic diseases over the life course, and our pilot study of African-American adolescents residing in the southern USA

presents evidence that daily prayer among this group is linked with a lower likelihood of being overweight or obese for at least a portion of their life course. Results from this study suggest the need to examine whether religious or spiritual practices during adolescence can potentially improve the health trajectory of African-Americans.

Prayer is an important component in a number of religious and spiritual traditions as this expression of faith is exhibited during corporate worship services and emphasized in dogma and sacred texts. This practice has been associated with positive health outcomes in many studies; however, the results have been far from definitive. Prayer has multiple forms (e.g., devotional, intercessory, petitionary), and additional research is needed to examine the degree to which each can have implications for health and well-being. Further, the meaning and use of prayer among individuals and populations can vary considerably. A recent critical review of studies examining the health impact of private prayer on outcomes of hospitalized patients found that the benefits of prayer were limited to individuals with high levels of religiosity (Hollywell and Walker 2009). African-Americans make up the most religious group in the USA (Pew Research Center. 2009), and prayer and other *R/S* practices are embedded within their religious and daily lives (Dill 2017); yet, the relationship between prayer and health outcomes among this group has been vastly understudied. For this population, prayer has been an accessible resource through which individuals can seek strength, comfort, guidance, protection, and healing from a power greater than themselves. It could also be a source of resilience against the stigma of obesity that can lead to people either being more comfortable being obese or more motivated to lose weight and improve overall health and well-being. Results from our study suggest that asset-based studies examining the relationship between faith-oriented practices, including prayer, and health outcomes among at-risk populations can be fruitful.

Although our results pointed to an association between *R/S* factors and excess weight among African-American adolescents, there are some limitations worth noting. The data for this study were collected from a small sample of African-American adolescents who live in the Deep South and are descendants of individuals enrolled in a longitudinal study. As such, generalizability of the results is limited. Data were only collected once; therefore, causal inferences could not be determined. Only a limited number of independent variables could be included in regression analysis because of the small sample size, thereby limiting the number of potential confounding factors considered. The independent variables in this study are drawn from self-administered surveys; therefore, the usual limitations associated with self-reported data (i.e., recall bias, social desirability) also apply to this study (Crockett et al. 1987). However, our cohort represents a high-risk population in the state with the greatest burden of cardiovascular disease (El-sadek et al. 2015; Roth et al. 2018) suggesting our findings could have broader relevance.

Conclusion

Religion and spirituality are important parts of life for many African-Americans, and participation in *R/S* practices has been linked to healthy attitudes and behaviors that result in beneficial health consequences (Knox et al. 1998; Rew

and Wong 2006; Zullig et al. 2006). However, research in this vein has tended to focus on adults; additional theoretical and empirical research is warranted to further elucidate the function of *R/S* practices among children and adolescents. The present study is one of the first to examine the association between *R/S* and excess weight among African-American adolescents in the Deep South. These findings suggest that preventive interventions offered to children and younger adolescents may have a strong impact on those with excess weight—which may have implications for weight status across the lifespan. Because *R/S* is such an important aspect of life in the African-American community, particularly those living in the South, faith-based health interventions that utilize a “whole family” approach and are inclusive of children and adolescents should be considered.

Acknowledgements This research was supported by the Center for Research on Men’s Health at Vanderbilt University and grants from the Department of Health and Human Services’ Office of Minority Health (Prime Award Number 1 CPIMP091054—Beech); the National Heart, Lung, and Blood Institute (HHSN268201800012I—Beech; 1R25HL126145—Beech and Norris; 1K01HL88735—Bruce); the National Institute of Aging (1K02AG059140—Thorpe); the Program for Research on Men’s Health in the Hopkins Center for Health Disparities Solutions (P60MD000214—Thorpe) and the Johns Hopkins Catalyst Award (Thorpe). The authors thank Ms. Mary Crump, Ms. Lovie Robinson, Dr. Gerrie Cannon Smith, Dr. London Thompson, Ms. Ashley Wicks, Rev. Thaddeus Williams, and Mr. Willie Wright for their support of this study and participation on the Jackson Heart KIDS Pilot Study Community Advisory Board.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in this study were conducted in accordance with the ethical standards of the Blinded University’s Institutional Review Board, consistent with US regulations and the Helsinki Declaration of 1975, as revised in 2000.

Informed Consent Informed consent was obtained from all individuals participants included in this study.

References


- Beech, B. M., Bruce, M. A., Crump, M. E., & Hamilton, G. E. (2017). The Jackson Heart KIDS Pilot Study: Theory-informed recruitment in an African American population. *Journal of Racial and Ethnic Health Disparities*, 4(2), 288–296. <https://doi.org/10.1007/s40615-016-0228-x>.
- Breland-Noble, A. M., Wong, M. J., Childers, T., Hankerson, S., & Sotomayor, J. (2015). Spirituality and religious coping in African American youth with depressive illness. *Mental Health, Religion & Culture*, 18(5), 330–341. <https://doi.org/10.1080/13674676.2015.1056120>.
- Bridges, L. J., & Moore, K. A. (2002). *Religion and spirituality in childhood and adolescence*. Washington, DC: Child Trends.
- Bruce, M. A., Beech, B. M., Crook, E. D., Sims, M., Griffith, D. M., Simpson, S. L., et al. (2013). Sex, weight status, and chronic kidney disease among African Americans: The Jackson Heart Study. *Journal of Investigative Medicine*, 61(4), 701–707. <https://doi.org/10.2310/JIM.0b013e3182880bf5>.
- Bruce, M. A., Beech, B. M., Griffith, D. M., & Thorpe, R. J., Jr. (2015). Weight status and blood pressure among adolescent African American males: The Jackson Heart KIDS Pilot Study. *Ethnicity and Disease*, 25(3), 305–312.

- Bruce, M. A., Beech, B. M., Griffith, D. M., & Thorpe, R. J., Jr. (2016). Spirituality, religiosity, and weight management among African American adolescent males: The Jackson Heart KIDS Pilot Study. *Behavioral Medicine, 42*(3), 183–189. <https://doi.org/10.1080/08964289.2015.1121133>.
- Bruce, M. A., Beech, B. M., Norris, K. C., Griffith, D. M., Sims, M., & Thorpe, R. J., Jr. (2017a). Sex, obesity, and blood pressure among African American adolescents: The Jackson Heart KIDS Pilot Study. *American Journal of Hypertension, 30*(9), 892–898. <https://doi.org/10.1093/ajh/hpx071>.
- Bruce, M. A., Martins, D., Duru, K., Beech, B. M., Sims, M., Harawa, N., et al. (2017b). Church attendance, allostatic load and mortality in middle aged adults. *PLoS ONE, 12*(5), e0177618. <https://doi.org/10.1371/journal.pone.0177618>.
- Burton, E. T., Wilder, T., Beech, B. M., & Bruce, M. A. (2017). Caregiver feeding practices and weight status among African American adolescents: The Jackson Heart KIDS Pilot Study. *Eating Behaviors, 27*, 33–38. <https://doi.org/10.1016/j.eatbeh.2017.11.002>.
- Cline, K. C., & Ferraro, K. F. (2006). Does religion increase the prevalence and incidence of obesity in adulthood. *Journal of the Scientific Study of Religion, 45*, 269–281.
- Crockett, L. J., Schulenberg, J. E., & Petersen, A. C. (1987). Congruence between objective and self-report data in a sample of young adolescents. *Journal of Adolescent Research, 2*(4), 383–392.
- Denton, M. L., Pearce, L. D., & Smith, C. (2008). Religion and spirituality on the path through adolescence. *National Study of Youth and Religion, 22*, 2010.
- Dill, L. J. (2017). “Wearing My Spiritual Jacket”: The role of spirituality as a coping mechanism among African American youth. *Health Education and Behavior, 44*(5), 696–704. <https://doi.org/10.1177/1090198117729398>.
- Dodor, B. (2012). The impact of religiosity on health behaviors and obesity among African Americans. *Journal of Human Behavior and Social Environment, 22*, 451–462.
- Duru, O. K., Sarkisian, C. A., Leng, M., & Mangione, C. M. (2010). Sisters in motion: A randomized controlled trial of a faith-based physical activity intervention. *Journal of the American Geriatrics Society, 58*(10), 1863–1869. <https://doi.org/10.1111/j.1532-5415.2010.03082.x>.
- El-sadek, L., Zhang, L., Vargas, R., Funchess, T., & Green, C. (2015). *Mississippi health disparities and inequalities report*. Retrieved from Jackson, MS.
- Feinstein, M., Liu, K., Ning, H., Fitchett, G., & Lloyd-Jones, D. M. (2010). Burden of cardiovascular risk factors, subclinical atherosclerosis, and incident cardiovascular events across dimensions of religiosity: The multi-ethnic study of atherosclerosis. *Circulation, 121*(5), 659–666. <https://doi.org/10.1161/CIRCULATIONAHA.109.879973>.
- Ferraro, K. F. (1998). Firm believers? Religion, body weight, and well being. *Review of Religion Research, 39*, 222–244.
- Fetzer Institute & National Institute on Aging Working Group. (2003). *Multidimensional measurement of religiousness spirituality for use in health research*. Kalamazoo, MI: Fetzer Institute.
- Flegal, K., & Cole, T. (2013). *Construction of LMS parameters for the Centers for Disease Control and Prevention 2000 growth charts (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Center for Health Statistics Eds)* (Vol. 63). Hyattsville, MD: National Center for Health Statistics.
- Gillum, R. F. (2006a). Frequency of attendance at religious services and leisure-time physical activity in American women and men: The Third National Health and Nutrition Examination Survey. *Annals of Behavioral Medicine, 31*(1), 30–35. https://doi.org/10.1207/s15324796abm3101_6.
- Gillum, R. F. (2006b). Frequency of attendance at religious services, overweight, and obesity in American women and men: The Third National Health and Nutrition Examination Survey. *Annals of Epidemiology, 16*(9), 655–660. <https://doi.org/10.1016/j.annepidem.2005.11.002>.
- Godbolt, D., Vaghela, P., Burdette, A. M., & Hill, T. D. (2017). Religious attendance and body mass: An examination of variations by race and gender. *Journal of Religion and Health. https://doi.org/10.1007/s10943-017-0490-1*.
- Hollywell, C., & Walker, J. (2009). Private prayer as a suitable intervention for hospitalised patients: A critical review of the literature. *Journal of Clinical Nursing, 18*(5), 637–651. <https://doi.org/10.1111/j.1365-2702.2008.02510.x>.
- Kim, K. H., Sobal, J., & Wethington, E. (2003). Religion and body weight. *International Journal of Obesity and Related Metabolic Disorders, 27*(4), 469–477. <https://doi.org/10.1038/sj.ijo.0802220>.
- Knox, D., Langehough, S. O., Walters, C., & Rowley, M. (1998). Religiosity and spirituality among college students. *College Student Journal, 4*, 430–432.
- Koenig, H., King, D., & Carson, V. B. (2012). *Handbook of religion and health*. Oxford: Oxford University Press.

- Kuczarski, R. J., Ogden, C. L., Guo, S. S., Grummer-Strawn, L. M., Flegal, K. M., Mei, Z., et al. (2002). 2000 CDC growth charts for the United States: Methods and development. *Vital and Health Statistics. Series 11: Data from the National Health Survey*, 246, 1–190.
- Lancaster, K. J., Carter-Edwards, L., Grilo, S., Shen, C., & Schoenthaler, A. M. (2014). Obesity interventions in African American faith-based organizations: A systematic review. *Obesity Reviews*, 15(Suppl 4), 159–176. <https://doi.org/10.1111/obr.12207>.
- Limbers, C. A., Young, D., Bryant, W., & Stephen, M. (2015). Associations between family religious practices, internalizing/externalizing behaviors, and body mass index in obese youth. *International Journal of Psychiatry in Medicine*, 49(3), 215–226. <https://doi.org/10.1177/0091217415582191>.
- Maselko, J., & Kubzansky, L. D. (2006). Gender differences in religious practices, spiritual experiences and health: Results from the US General Social Survey. *Social Science and Medicine*, 62(11), 2848–2860. <https://doi.org/10.1016/j.socscimed.2005.11.008>.
- McNutt, L.-A., Wu, C., Xue, X., & Hafner, J. P. (2003). Estimating the relative risk in cohort studies and clinical trials of common outcomes. *American Journal of Epidemiology*, 157(10), 940–943.
- Norris, K., & Nissenson, A. R. (2008). Race, gender, and socioeconomic disparities in CKD in the United States. *Journal of the American Society of Nephrology*, 19(7), 1261–1270. <https://doi.org/10.1681/asn.2008030276>.
- Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the United States, 2011–2012. *JAMA*, 311(8), 806–814. <https://doi.org/10.1001/jama.2014.732>.
- Ogden, C. L., Wei, R., Curtin, L. R., & Flegal, K. M. (2010). The 2000 Centers for Disease Control and Prevention growth charts: Several insights after 8 years. *Nestle Nutrition Workshop Series: Paediatric Programme*, 65, 181–193. <https://doi.org/10.1159/000281163>. (discussion 193–185).
- Pattillo-McCoy, M. (1998). Church culture as a strategy of action in the Black community. *American Sociological Review*, 63, 767–784.
- Pew Research Center. (2009). *A religious portrait of African Americans*. Retrieved from <http://www.pewforum.org/2009/01/30/a-religious-portrait-of-african-americans/>.
- Pew Research Center. (2016). *Religion in everyday life*. Retrieved from <http://assets.pewresearch.org/wp-content/uploads/sites/11/2016/04/Religion-in-Everyday-Life-FINAL.pdf>.
- Regnerus, M. (2007). *Forbidden fruit: Sex & religion in the lives of American teenagers*. Oxford: OUP.
- Regnerus, M., Smith, C., & Fritsch, M. (2003). *Religion in the lives of American adolescents*. Chapel Hill, NC: National Study of Youth and Religion.
- Rew, L., & Wong, Y. J. (2006). A systematic review of associations among religiosity/spirituality and adolescent health attitudes and behaviors. *Journal of Adolescent Health*, 38(4), 433–442.
- Roth, G. A., Johnson, C. O., Abate, K. H., Abd-Allah, F., Ahmed, M., Alam, K., et al. (2018). The burden of cardiovascular diseases among US states, 1990–2016. *JAMA Cardiology*. <https://doi.org/10.1001/jamacardio.2018.0385>.
- Sack, D. (2001). *Whitebread protestants: Food and religion in American culture*. New York: Palgrave.
- Smith, C., & Denton, M. L. (2009). *Soul searching: The religious and spiritual lives of American teenagers*. Oxford: Oxford University Press.
- Smith, C., Denton, M. L., Faris, R., & Regnerus, M. (2002). Mapping American adolescent religious participation. *Journal for the Scientific Study of Religion*, 41(4), 597–612.
- Thorpe, R. J., Jr., Kelley, E., Bowie, J. V., Griffith, D. M., Bruce, M., & LaVeist, T. (2014). Explaining racial disparities in obesity among men: Does place matter? *American Journal of Men's Health*. <https://doi.org/10.1177/1557988314551197>.
- Thorpe, R. J., Jr., Parker, L. J., Cobb, R. J., Dillard, F., & Bowie, J. (2017). Association between discrimination and obesity in African-American men. *Biodemography and Social Biology*, 63(3), 253–261. <https://doi.org/10.1080/19485565.2017.1353406>.
- Underwood, L. G., & Teresi, J. A. (2002). The daily spiritual experience scale: Development, theoretical description, reliability, exploratory factor analysis, and preliminary construct validity using health-related data. *Annals of Behavioral Medicine*, 24(1), 22–33.
- Vidmar, S., Carlin, J., Hesketh, K., & Cole, T. (2004). Standardizing anthropometric measure in children and adolescents with new functions in egen. *The Stata Journal*, 4(1), 50–55.
- Zou, G. (2004). A modified poisson regression approach to prospective studies with binary data. *American Journal of Epidemiology*, 159(7), 702–706.
- Zullig, K., Ubbes, V. A., Pyle, J., & Valois, R. F. (2006). Self-reported weight perceptions, dieting behavior, and breakfast eating among high school adolescents. *Journal of School Health*, 76(3), 87–92.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Affiliations

Marino A. Bruce^{1,2,3,4}  · **Bettina M. Beech**^{3,4} · **Tanganyika Wilder**⁵ ·
E. Thomaseo Burton^{6,7} · **Jylana L. Sheats**⁸ · **Keith C. Norris**^{3,4,9} ·
Roland J. Thorpe Jr.^{3,4,10,11}

¹ Program for Research on Faith and Health, Center for Research on Men's Health, Vanderbilt University, 2301 Vanderbilt Place, Nashville, TN 37235-1665, USA

² Center for Medicine, Health and Society, Vanderbilt University, Nashville, TN, USA

³ Department of Population Health Science, John D. Bower School of Population Health, University of Mississippi Medical Center, Jackson, MS, USA

⁴ Myrlie Evers Williams Institute for the Elimination of Health Disparities, University of Mississippi Medical Center, Jackson, MS, USA

⁵ Department of Biological Sciences, Florida A&M University, Tallahassee, FL, USA

⁶ Department of Pediatrics, University of Tennessee Health Science Center, Memphis, TN, USA

⁷ Children's Foundation Research Institute, Le Bonheur Children's Hospital, Memphis, TN, USA

⁸ Department of Global Community Health and Behavioral Sciences, Tulane University School of Public Health and Tropical Medicine, New Orleans, LA, USA

⁹ David C. Geffen School of Medicine at UCLA, Los Angeles, CA, USA

¹⁰ Department of Health, Behavior, and Society, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA

¹¹ Program for Research on Men's Health, Hopkins Center for Health Disparities Solutions, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA