

**Identifying a knowledge gap of blueberry health benefits: The role of education, income, generation and gender**

Shuyang Qu  
Assistant Professor  
Iowa State University  
206D Curtiss Hall  
Ames, IA 50014  
[squ@iastate.edu](mailto:squ@iastate.edu)  
515-294-8343

Tori Bradley  
[toriraebradley@ufl.edu](mailto:toriraebradley@ufl.edu)  
University of Florida

Joy N. Rumble  
Assistant Professor  
University of Florida  
121D Bryant Hall  
P.O. Box 112060  
Gainesville, FL 32611  
[jnrumble@ufl.edu](mailto:jnrumble@ufl.edu)  
352-273-1663

Research type: Quantitative

Research Priority Area: Ag Communications

























This research investigated the influence of socio-demographic characteristics on overall knowledge of the health benefits of blueberries. Further analysis of potential knowledge gaps of individual health benefits of blueberries should be explored. Researchers should consider additional knowledge questions or alternative measures of knowledge, such as open-ended responses graded by a rubric, to determine the breadth and consistency of the knowledge gap observed related to the health benefits of blueberries. Future research should also analyze other aspects that have been formerly suggested to attribute to the knowledge gap, including level of motivation, prior knowledge, use of information, relevant social contacts, communication skills, and structure of the media system (Bonfadelli, 2002). In terms of the influence of motivation on knowledge level, it is worthwhile to explore what activities, life experiences or family backgrounds influence people's motivation to acquire health information such as the health benefits of blueberries. These findings could inform communicators in creating effective activities and messages to boost their audience's motivation to seek out blueberry-related information. In addition, this information would help communicators to use storytelling as a strategy to engage target audiences by tying communication to relevant life experiences and family backgrounds.

To develop effective communication strategies to promote blueberries, future research should examine how consumers currently seek and receive blueberry-related content. The use of new media (including smartphone, social media, and interpersonal online social network) for nutritional information should also be analyzed as new media has become an important outlet for health-related information (Smith, 2015). Researchers should further investigate individual's information processing patterns regarding health-related information. For example, research could test how different message appeals (e.g. rational appeal, emotional appeal, and social appeal) impact populations with different education levels in the acceptance and storage of blueberry health benefit knowledge.

Research studies regarding health education have shown positive, encouraging, inspiring messaging are more persuasive and would be more likely to make long lasting impact to health behavior change (McKinnon, 2007; Ybarra, Holtrop, Prescott, & Strong, 2014). Researchers should create positive messages about the blueberry benefits and test the message effectiveness. Effective messages could be used for cancer and heart health campaign in addition to blueberry promotion and marketing.

In terms of social contacts and communication skills, researchers could utilize focus groups with only high blueberry knowledge participants and only low blueberry knowledge participants to discuss how social contacts and communication skills influence individuals' knowledge acquisition about blueberries. Themes from different knowledge level groups could be compared to inform strategies to enhance blueberry knowledge acquisition through social events or communication trainings. Further research is needed to identify what media channels consumers frequently use to seek nutrition-related information among audiences with different education levels. The findings will assist agricultural and health communicators in identifying the most appropriate channel to target their audiences.

This study focused solely on the health benefits of blueberries. The methods and model used in this study could be applied to the study of vegetables, grains, or other fruits. Researchers should expand the research scope and examine whether knowledge gap of health benefits exist for other foods. Such studies could help educators and communicators to develop materials to advance the health and nutrition education of their target audiences.

## References

- Attaway, A. D., Clark, B., & Hummel, N. A. (2012). Growing blueberry knowledge via social networks. *International Journal of Fruit Science*, *12*(1-3), 342-349. doi:10.1080/15538362.2011.619453
- Baker, R., Brick, J., Bates, N., Battaglia, M., Couper, M., Dever, J., ... Tourangeau, R. (2013). Summary report of the aapor task force on non-probability sampling. *Journal of Survey Statistics and Methodology*, *1*(2), 90-143. doi:10.1093/jssam/smt008
- Bonfadelli, H. (2002). The Internet and knowledge gaps: A theoretical and empirical investigation. *European Journal of Communication*, *17*(1), 65-84. doi:10.1177/0267323102017001607
- Bornsek, S. M., Ziberna, L., Polak, T., Vanzo, A., Ulrih, N. P., Abram, V., Tramer, F., & Passamonti, S. (2012). Bilberry and blueberry anthocyanins act as powerful intracellular antioxidants in mammalian cells. *Food Chemistry*, *13*(4), 1878-1884. doi:10.1016/j.foodchem.2012.03.092
- Bump, P. (2014, March 25). Here is when each generation begins and ends, according to facts. *The Atlantic*. Retrieved from <http://www.theatlantic.com/national/archive/2014/03/here-is-when-each-generation-begins-and-ends-according-to-facts/359589/>
- Cacciatore, M., Scheufele, D., & Corley, E. (2014). Another (methodological) look at knowledge gaps and the Internet's potential for closing them. *Public Understanding of Science*, *23*(4), 376-394. doi:10.1177/0963662512447606
- Campbell, K. J., Abbott, G., Spence, A. C., Crawford, D. A., McNaughton, S. A., & Ball, K. (2013). Home food availability mediates associations between mothers' nutrition knowledge and child diet. *Appetite*, *71*(1), 1-6. doi:10.1016/j.appet.2013.07.006
- Centers for Disease Control and Prevention (2015). *Leading causes of death. Fast Stats*. Retrieved from <http://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm>
- Chew, F., & Palmer, S. (1994). Interest, the knowledge gap, and television programming. *Journal of Broadcasting & Electronic Media*, *38*(3), 271-287. Retrieved from <http://www.tandfonline.com/doi/abs/10.1080/08838159409364265?journalCode=hbem20#.VqAAAVMrLVo>  
<http://dx.doi.org/10.1037/h0042761>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.
- De Irala-Estevez, J., Groth, M., Johansson, L., Oltersdorf, U., Prattala, R., & Martinez-Gonzalez, M. (2000). A systematic review of socio-economic differences in food habits in Europe:

- Consumption of fruit and vegetables. *European Journal of Clinical Nutrition*, 54(9), 706-714. doi:10.1038/sj.ejcn.1601080
- De Vriendt, T., Matthys, C., Verbeke, W., Pynaert, I., & De Henauw, S. (2009). Determinants of nutrition knowledge in young and middle-aged Belgian women and the association with their dietary behaviour. *Appetite*, 52(3), 788-792. doi:10.1016/j.appet.2009.02.014
- Ettema, J. S., & Kline, F. G. (1977). Deficits, differences, and ceilings: Contingent conditions for understanding the knowledge gap. *Communication Research-an International Quarterly*, 4(2), 179. Retrieved from [http://deepblue.lib.umich.edu/bitstream/handle/2027.42/67566/10.1177\\_009365027700400204.pdf?sequence=2](http://deepblue.lib.umich.edu/bitstream/handle/2027.42/67566/10.1177_009365027700400204.pdf?sequence=2)
- Ettema, J. S., Brown, J. W., & Luepker, R. V. (1983). Knowledge gap effects in a health information campaign. *The Public Opinion Quarterly*, 47(4), 516-527. doi:10.1086/268809
- Evans, E., & Ballen, F. (2014). *An overview of US blueberry production, trade, and consumption, with special reference to Florida (FE952)*. Gainesville: University of Florida Institute of Food and Agricultural Sciences. Retrieved from <https://edis.ifas.ufl.edu/fe952>.
- Field, A. P. (2013). *Discovering statistics using IBM SPSS statistics* (4th ed.). Los Angeles: Sage.
- Fretz, A., Schneider, A. L., McEvoy, J. W., Hoogeveen, R., Ballantyne, C. M., Coresh, J., & Selvin, E. (2016). The association of socioeconomic status with subclinical myocardial damage, incident cardiovascular events, and mortality in the ARIC study. *American Journal of Epidemiology*, 183(5), 452-461. doi:10.1093/aje/kwv253
- Gaziano, C. (2017). Knowledge Gap: History and Development. *The International Encyclopedia of Media Effects*. doi:10.1002/9781118783764.wbieme0041
- Giskes, K., Avendaño, M., Brug, J., & Kunst, A. E. (2010). A systematic review of studies on socioeconomic inequalities in dietary intakes associated with weight gain and overweight/obesity conducted among European adults: Socioeconomic inequalities in dietary intakes. *Obesity Reviews*, 11(6), 413-429. doi:10.1111/j.1467-789X.2009.00658.x
- Giskes, K., Turrell, G., Patterson, C., & Newman, B. (2002). Socio-economic differences in fruit and vegetable consumption among Australian adolescents and adults. *Public Health Nutrition*, 5(5), 663-669. doi:10.1079/PHN2002339
- Grabe, M. E., Kamhawi, R., & Yegiyani, N. (2009). Informing citizens: How people with different levels of education process television, newspaper, and web news. *Journal of Broadcasting & Electronic Media*, 53(1), 90-111. doi:10.1080/08838150802643860



- Griffiths, K. M., Calcar, A. L., Banfield, M., & Tam, A. (2009). Systematic review on Internet Support Groups (ISGs) and depression (2): What is known about depression ISGs? *Journal of Medical Internet Research*, *11*(3). doi:10.2196/jmir.1303.
- Hendrie, G. A., Coveney, J., & Cox, D. (2008). Exploring nutrition knowledge and the demographic variation in knowledge levels in an Australian community sample. *Public Health Nutrition*, *11*(12), 1365-1371. doi:10.1017/S1368980008003042
- Ho, S. (2012). The knowledge gap hypothesis in Singapore: The roles of socioeconomic status, mass media, and interpersonal discussion on public knowledge of the H1N1 flu pandemic. *Mass Communication and Society*, *15*(5), 695-717. doi:10.1080/15205436.2011.616275
- Holbrook, T. M. (2002). Presidential campaigns and the knowledge gap. *Political Communication*, *19*(4), 437-454. doi:10.1080/10584600290109997
- Kalton, G., & Flores-Cervantes, I. (2003). Weighting methods. *Journal of Official Statistics*, *19*(2), 81-97. Retrieved from <http://www.jos.nu/articles/article.asp>
- Kell, K. P., Judd, S. E., Pearson, K. E., Shikany, J. M., & Fernández, J. R. (2015). Associations between socio-economic status and dietary patterns in US black and white adults. *British Journal of Nutrition*, *113*(11), 1792-1799. doi:10.1017/S0007114515000938
- Kenkel, D. S. (1991). Health behavior, health knowledge, and schooling. *Journal of Political Economy*, *99*(2), 287-305. doi:10.1086/261751
- Kim, S. (2008). Testing the knowledge gap hypothesis in south Korea: Traditional news media, the internet, and political learning. *International Journal of Public Opinion Research*, *20*(2), 193-210. doi:10.1093/ijpor/edn019
- Kiviniemi, M. T., Orom, H., Waters, E. A., McKillip, M., & Hay, J. L. (2018). Education-based disparities in knowledge of novel health risks: The case of knowledge gaps in HIV risk perceptions. *British Journal of Health Psychology*, *23*(2), 420-435. doi:10.1111/bjhp.12297
- Krikorian, R., Shidler, M. D., Nash, T. A., Kalt, W., Vinquist-Tymchuk, M. R., Shukitt-Hale, B., & Joseph, J. A. (2010). Blueberry supplementation improves memory in older adults. *Journal of Agriculture and Food Chemistry*, *58*(7), 3996-4000. doi:10.1021/jf9029332
- Kwak, N. (1999). Revisiting the knowledge gap hypothesis: Education, motivation, and media use. *Communication Research*, *26*(4), 385-413. doi:10.1177/009365099026004002
- Lee, C. (2009). The role of Internet engagement in the health-knowledge gap. *Journal of Broadcasting & Electronic Media*, *53*(3), 365-382. doi:10.1080/08838150903102758

- Liu, Y., & Eveland, W. (2005). Education, need for cognition, and campaign interest as moderators of news effects on political knowledge: An analysis of the knowledge gap. *Journalism & Mass Communication Quarterly*, 82(4), 910-929. doi:10.1177/107769900508200410
- Liu, Y., Song, X., Zhang, D., Zhou, F., Wang, D., Wei, Y., Gao, F., Xie, L., Jia, G., Wu, W., & Ji, B. (2012). Blueberry anthocyanins: Protection against ageing and light-induced damage in retinal pigment epithelial cells. *British Journal of Nutrition*, 108(1), 16-27. doi:10.1017/S000711451100523X
- Lovrich, N. P., & Pierce, J. C. (1984). "Knowledge gap" phenomena: Effect of situation-specific and transsituational factors. *Communication Research*, 11(3), 415-434. doi:10.1177/009365084011003005
- Mead, E. L., Cohen, J. E., Kennedy, C. E., Gallo, J., & Latkin, C. A. (2015). The role of theory-driven graphic warning labels in motivation to quit: a qualitative study on perceptions from low-income, urban smokers. *BMC public health*, 15(1), 92. doi:10.1186/s12889-015-1438-6
- Meier, A., Lyons, E. J., Frydman, G., Forlenza, M., & Rimer, B. K. (2007). How cancer survivors provide support on cancer-related internet mailing lists. *Journal of Medical Internet Research*, 9(2). doi:10.2196/jmir.9.2.e12
- National Agricultural Statistics Service (2015). *Noncitrus Fruits and Nuts 2014 Summary* (ISSN: 1948-2698). Washington, D.C. United States Department of Agriculture. Retrieved from <http://usda.mannlib.cornell.edu/usda/current/NoncFruNu/NoncFruNu-07-17-2015.pdf>
- Neuman, R., Just, M. R., & Crigler, A. N. (1992). *Common knowledge: News and the construction of political meaning*. Chicago, IL: University of Chicago Press.
- Prior, M. (2005). News vs. entertainment: How increasing media choice widens gaps in political knowledge and turnout. *American Journal of Political Science*, 49(3), 577-592. doi:10.1111/j.1540-5907.2005.00143.x
- Reeves, J. A. (2016). *Sugar-sweetened beverages: Closing the nutrition knowledge gap with innovative front-of-package labeling and strategically placed educational signage* (Master's thesis). California State University, Sacramento, California.
- Rotgans, J. I., & Schmidt, H. G. (2017). The role of interest in learning: Knowledge acquisition at the intersection of situational and individual interest. In *The Science of Interest* (pp. 69-93). Springer, Cham.
- Schrager, M. A., Hilton, J., Gould, R., & Kelly, V. E. (2015). Effects of blueberry supplementation on measures of functional mobility in older adults. *Applied Physiology, Nutrition, and Metabolism*, 40(6), 543-549. doi:10.1139/apnm-2014-0247

- Shim, M. (2008). Connecting Internet use with gaps in cancer knowledge. *Health Communication, 23*(5), 448-461. doi:10.1080/10410230802342143
- Sligo, F. X., & Jameson, A. M. (2000). The knowledge—behavior gap in use of health information. *Journal of the American Society for Information Science, 51*(9), 858-869. doi:10.1002/(SICI)1097
- Smith, A. (April, 2015). U.S. Smartphone Use in 2015. [Pew Research Center Website]. Retrieved from <http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/>
- Tchicaya, A., Lorentz, N., Demarest, S., & Beissel, J. (2018). Persistence of socioeconomic inequalities in the knowledge of cardiovascular risk factors five years after coronary angiography. *European Journal of Cardiovascular Nursing, 2018*(17), 136-147. doi: 10.1177/1474515117720789.
- Tichenor, P. J., Donohue, G. A., & Olien, C. N. (1970). Mass media flow and differential growth in knowledge. *The Public Opinion Quarterly, 34*(2), 159-170. doi:10.1086/267786
- Turrell, G. & Kavanagh, A. M. (2006). Socio-economic pathways to diet: Modelling the association between socio-economic position and food purchasing behaviour. *Public Health Nutrition, 9*(3), 375-383. doi:10.1079/PHN2005850
- U.S. Department of Agriculture. (2014). *2014 Blueberry Statistics*. New Jersey Field Office. Retrieved from [http://www.nass.usda.gov/Statistics\\_by\\_State/New\\_Jersey/Publications/Blueberry\\_Statistics/2014%20Blueberry%20Statistics.pdf](http://www.nass.usda.gov/Statistics_by_State/New_Jersey/Publications/Blueberry_Statistics/2014%20Blueberry%20Statistics.pdf)
- USDA National Institute of Food and Agriculture. (April, 2016). Investigating the health benefits of berries. [United States Department of Agriculture Website]. Retrieved from <https://nifa.usda.gov/announcement/investigating-health-benefits-berries>
- USDA SNEP-Ed Connection. (2017). Seasonal Produce Guide: What's in Season? Blueberries. [United States Department of Agriculture Website]. Retrieved from <https://snaped.fns.usda.gov/seasonal-produce-guide/blueberries>
- U.S. Highbush Blueberry Council. (2014a). *Blueberry Demand on the rise in U.S., Consumers trending younger*. Folsom, CA. Retrieved from <http://www.blueberrycouncil.org/blueberry-demand-rise-u-s-consumers-trending-younger/>
- U.S. Highbush Blueberry Council. (2014b). *Health Research*. Folsom, CA. Retrieved from <http://www.blueberrycouncil.org/health-professionals/health-research/>
- Viswanath, K., Kahn, E., Finnegan, J. R., Hertog, J., & Potter, J. D. (1993). Motivation and the knowledge gap: Effects of a campaign to reduce diet-related cancer risk. *Communication Research, 20*(4), 546-563. doi:10.1177/009365093020004003

- Whyte, A., & Williams, C. (2012). The cognitive effects of acute blueberry interventions on 7-9 year old children. *Appetite*, 59(2), 637. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0195666312003637>
- Winkleby, M. A., Jatulis, D. E., Frank, E., & Fortmann, S. P. (1992). Socioeconomic status and health: How education, income, and occupation contribute to risk factors for cardiovascular disease. *American Journal of Public Health*, 82(6), 816-820. doi:10.2105/AJPH.82.6.816
- Yan, L. (2014). Blueberry and health. [United States Department of Agriculture: Agricultural Research Service Website]. Retrieved from <https://www.ars.usda.gov/plains-area/gfnd/gfhnc/docs/news-2014/blueberries-and-health/>
- Ybarra, M. L., Holtrop, J. S., Prescott, T. L., & Strong, D. (2014). Process evaluation of a mHealth program: Lessons learned from Stop My Smoking USA, a text messaging-based smoking cessation program for young adults. *Patient education and counseling*, 97(2), 239-243.
- McKinnon, R. (2007). Lessons from VERB: A case for branding in nutrition education. *Journal of nutrition education and behavior*, 39(2), S53-S54.