

## Use Multivariate Statistics to Study Chocolate Nutrition Science

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### Abstract

**M**any people like eating chocolate, but may have some concerns on health risk, especially to people with Cardiovascular or Neurovascular diseases. The objectives of this paper are to use Multivariate Statistics to define a health biometric on choosing a healthy chocolate to patients with heart disease. Chocolate, made from cocoa beans, contains flavonoids which contain antioxidants. Flavonoids are the most abundant polyphenols in the human diet. Polyphenols have antioxidant properties which can prevent aging and is also beneficial to heart disease and diabetes patients. People with heart diseases should eat less of saturated fat, trans fat, sodium, and cholesterol. They should eat more dietary fiber. Cocoa flavanols promote healthy blood flow circulation from head to toe. The heart, brain, and muscle depend on a healthy circulatory system. Data has been collected on 20+ chocolate ingredient contents from 60+ different types of chocolate. Multivariate correlation study has found that (1) strong negative correlation between Cocoa and Sugar, and (2) a strong positive correlation between Dietary Fiber and Iron. Most dark chocolate contains more cocoa and less sugar. Dietary fiber and iron are high in correlation because of the high cocoa percent. The above two correlations can be further explained by conducting the Hierarchical Clustering Analysis on separating the Dark Chocolate, Milk Chocolate, and White Chocolate. The Cocoa and Calcium are the deciding factors to separate these three Chocolates. Based on Chocolate Science. These healthiest chocolates can actually help prevent heart disease. The same approach can be applied to help people with other diseases (cancer, diabetes...). In Big Data World, the Multivariate Statistics can help connect different data and explain the Science in a predictive or/and empirical modeling.

### Biography:

Mason Chen is a certified IASSC Black Belt and certified IBM SPSS Statistics/Modeler Data Miner Professional. His research is concentrating on the Computational Biology, Chemistry and Computational Physics. Mr. Chen has published more than 20 Conference Proceeding Papers in major Statistics and Quality Conferences including ASA, ASQ, IWSM, JMP, IEOM, ISF... Mr. Chen is familiar with Multivariate Statistics, Data Mining, Artificial Intelligence, Machine Learning, as well as Minitab, SAS/JMP, JAVA/Python programming. He is currently enrolled in Stanford University OHS program while continuing his research development.

### Speaker Publications:

1. Hodgson J. M., Devine, A., Burke, V., Dick, I. M., & Prince, R. L. (2008, January). Chocolate consumption and bone density in older women. *American Journal of Nutrition*. 87(1),175-80.
2. Allen, R. R., Carson, L., Kwik-Urbe, C., Evans, E. M., & Erdman, J. W. (2008 April), "Daily consumption of a dark chocolate containing flavanols and added sterol esters affects cardiovascular risk factors in a normotensive population with elevated cholesterol", *Journal of Nutrition*. 138(4):725-31.
3. Latif, R. (2013, March). Chocolate/cocoa and human health: a review. *The Netherlands Journal of Medicine*. 71(2):63-8.
4. Patel Wang, J., Varghese, M., Ono, K., Yamada, M., Levine, S., Tzavaras, N., Pasinetti, G. M. (2014). Cocoa extracts reduce Oligomerization of amyloid- $\beta$ : implications for cognitive improvement in Alzheimer's disease. *Journal of Alzheimer's disease*, 41(2):643-50.
5. R. K., Brouner, J., & Spendiff, O. (2015, December). Dark chocolate supplementation reduces the oxygen cost of moderate intensity cycling. *Journal of the International Society of Sports Nutrition* 2015, 12:47.

### A Webinar on Nutrition & Dietetics

July 20, 2020.

### Abstract Citation:

Mason Chen; Use Multivariate Statistics to Study Chocolate Nutrition Science; *Food Security and Food Chemistry* 2020; August 24, 2020.

