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Vegetarian diets, maybe not as healthy as you think

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Abstract

Many are approaching vegetarianism as a viable diet option in recent years, presuming that adopting a vegetarian diet would provide health benefits. This paper explores the possibilities of physical and mental effects that vegetarianism may have on humans and its extent by the use of regression analysis. To measure the possible impacts vegetarian diets may hold on both the physiology and physical aspects of humans, we have utilized the measures of life expectancy and prevalence of depression respectively. Cross-sectional data were examined from sources such as the World Health Organization, Our World In Data and the World Bank, with figures on vegetarian adoption rates to be made available on Statista. Current studies on mental health impacts are inconclusive, and many relied on survey data to produce findings. The utilization of cross-sectional data on a macro basis would allow our study to account for regional differences whilst providing an objective result. This study aims to raise awareness of the positive and negative impacts of a vegetarian diet, to assist people to make informed decisions. This would be essential as plant-based diets have been receiving more attention in the media.

*Keyword*s: vegetarian, diet, physical health, mental health, depression, life expectancy

Introduction

There has been a lot of discussions recently about the positive benefits of a vegetarian from a physical health standpoint, however little is currently understood on the effects of an unbalanced diet. This study aims to investigate the presence of positive and negative aspects on both the physical and the mental issues arising from a long-term adoption of a vegetarian diet. In our study, we have yet to determine a positive or negative side of adopting a vegetarian diet due to a lack of comprehensive secondary data to refer to with regards to the adoption figures of vegetarian diets worldwide. The data that the research has worked with were mostly from the compilation of trusted data sets from reliable sources, putting in place the relevant variables to better structure the algorithm that can be used and applied, upon receiving adequate fundings to proceed with the research study. We have compiled and would make our findings available to the public when more data is available in the future, enabling us to update the paper with additional reliable data and to provide a more definitive answer with regards to our research question. Until then, we have redirected our attention to educating the public and increasing awareness of possible risks one should understand before adopting a vegetarian diet.

Literature Review

When viewed at a first glance, there seem to be many benefits to having a vegetarian diet as compared to a more well-rounded diet including meat. There have been studies showing the benefits of having a vegetarian diet as compared to one consisting of meat, however, there are many different definitions of being a vegetarian and thus the different types of nutrients intake that they would consume. Some may argue that vegetarian diets are healthier and much more beneficial as compared to an average diet which consists of all kinds of food sources. Others may, however, rebut that a vegetarian diet possibly holds a negative association with one's physical and mental well-being.

The articles discussed mostly recognise the numerous effects of vegetarian diets, and how each of them being distinct in their ways, such as the prevalence of depression symptoms and possible physical and mental health implications We acknowledge that a vegetarian diet does improve one's physical health to a certain extent, albeit control variables such as one's lifestyle activities and work-life may concurrently play a huge role in affecting one's health. There are mainly two sections that we can explore - physical and mental health.

Impact on Physical Health

In terms of physical health, there were investigations into the several lifestyle diseases in relation to what a vegetarian diet may incur. Discussions were made among various diseases such as diabetes, cardiovascular disease, stroke and dementia, on how a vegetarian diet could be associated with each of them. For example, the article on a vegetarian diet as a panacea stated that ingredients included in a vegetarian diet comprise soybean, legumes, and nuts (Segasothy & Phillips, 1999). The authors elaborated that these ingredients showed that cholesterol levels

could decrease upon substantial intake over a certain period of time, based on their additional reviews. This realisation could determine that vegetarian diets are indeed beneficial to one's physical well-being, where these ingredients, once consumed, can further prevent the potential occurrence of diseases. The article also supplemented and readdressed that other healthy lifestyle practices, such as abstinence from smoking and alcohol, should be included to enhance the prevention of diseases, and not only rely solely on one's diet (Segasothy &, Phillips, 1999).

There is also the issue of nutritional intake regarding those not primarily found in a plant-based diet. For example, in an article on the calcium status of a plant-based diet, the study shows a positive calcium balance on a lactovegetarian diet (Mayer et al., 2014). The results are expected from the lactovegetarian diet due to its inclusion of dairy products which are great sources of calcium, while the results for the vegan diet is surprisingly enough for everyday life considering the lack of dairy products. Further research is necessary for calcium balance over longer periods while paying attention to the bone status (Mayer et al., 2014).

According to Appleby and Key (2015), more than one billion adults worldwide are overweight and at least 300 million of them are obese. This study also states the studies of western vegetarians which have consistently shown that vegetarians have a lower BMI than otherwise comparable non-vegetarians. There are also differences in weight gain in vegetarians and vegans during adulthood, it is also reflected in a lower prevalence of obesity. Furthermore, as obesity is a major cause of morbidity/mortality, the author also states vegetarian and vegan diets in weight management. However, the consistent findings of low BMI in western countries may not apply to non-western countries. For example, there was no difference in mean BMI among the Indian Migration Study of 7000 participants where 33% of whom are vegetarians, thus further research is necessary.

Also, we understand that physical health could mean both the physical aspects and the general health condition of a human being, while it can also entail a "cause" and "effect" structure where the "cause" would refer to peoples' lifestyles and the "effect" would refer to the corresponding consequences of these lifestyles. For example, a person with a more active lifestyle would generally have better physical conditions and physique compared to another inactive person. We believe the authors Bedford and Barr (2005) understand this reasoning, and hence they compared the "cause" side of the physical health of vegetarians.

In their span of research gathering data from self-reported vegetarians in the British Columbia population, be it through questionnaires or in-person interviews, the authors realised that the self-reported vegetarians were mostly females, and they had lower BMI than non-vegetarians. Bedford and Barr (2005) found out that males vegetarians and non-vegetarians mostly had the same BMI, and that female vegetarians were more physically active than male vegetarians while male vegetarians were more inclined to consume nutritive supplements. The authors thus concluded that vegetarians were more health-conscious when it comes to food intake. With this conclusion made by the authors, we can see that vegetarians had more initiatives to take care of themselves in terms of supplementing their nutritional intake or staying active. As much as other research articles may mention potential diseases and detrimental or positive health effects of a vegetarian diet, the research article here elaborated more on the "causes" of physical health, which is being health conscious. We could also assume that more effort is being made by these vegetarians to live better by eating better. Therefore, we are exposed to the prevention side of physical health while understanding that staying health-conscious could at least allow one to be more aware of his or her health and bring about better and earlier prevention for possible adverse health issues.

We could thus have a glimpse of the above-mentioned level or consequence of one's physical health in relation to the ingredients consumed and calcium intake from a vegetarian diet. Additional discussions and debate on the physical health aspects from the effects of a vegetarian diet would be explored entirely in this paper, while we identify from a diverse source of information to better provide a significant overview of the discussed topic.

Impact on Mental Health

Current findings and research conducted on the possible mental impacts as a consequence of the adoption of a vegetarian diet have produced results that display a plausible association between the two factors. An analysis on the Constances cohort study on food frequency and diet types to the presence of symptoms of depression found a positive association with the food groups based on the number of food types that were absent in one's diet, (Matta et al., 2018). However, despite the presence of a large sample population and consideration of chronic diseases as a variable in the study, limitations in the research method prevented the drawing of causality as the presence of depressive symptoms may have preceded the adoption of a vegetarian diet despite results identifying possible relationships between both factors.

A study on the German Health Interview and Examination Survey subverted some of the limitations presented in the study of the Constances cohort, as it provided the time frame by which participants had started adopting a vegetarian diet whilst presenting the consumption patterns of participants over 12 months, (Michalak et al., 2012), thereby, allowing the disorder prevalence rate to be drawn and concluded upon. Findings presented by the research displays that vegetarians show an elevated prevalence rate of mental disorders whilst accepting that limitations existed within the research method, and may therefore produce no evidence of a

vegetarian diet playing a role in the etymology of mental disorders, (Michalak et al., 2012). As the consumption pattern of the participants relied on the individual's submission, results may not have been accurate due to the nature of the data recording. Additionally, as the German Health Interview and Examination Survey were conducted based on a community representative survey, results do not provide indicative and collective conclusions on other social-demographic groups whereby vegetarian diets are a part of its social norm.

In a cross-sectional and longitudinal analysis of culturally diverse group samples, 22,417 participants across Germany, Russia, the United States and China were surveyed on their diet types and mental health conditions to identify the prevalence of depressive symptoms. Longitudinal studies were then conducted on the students presented within the sample thereby allowing correlations to be drawn from the data, by which only vegetarian Chinese students displayed tendencies to be more easily depressed as compared to students of other nationalities (Germany, Russia and the United States) and had also reported lower levels of positive mental health, however, correlations were low with none exceeding a value of $r = 0.11$, (Lavallee et al., 2019). Findings presented vegetarian diets in Chinese students to be a possible predictive variable for depression and anxiety, with vegetarians showing minor increments in the level of depressive symptoms and anxiety on the follow-up. (Lavallee et al., 2019). Findings were corroborative with past research linking vegetarian diets to increased anxiety and presence of depression, however, conclusions were provided wherein vegetarian diets were not reliable predictors for mental health. Detailed dietary intake structures were not accounted for within the questionnaire due to the limitations of the research method and data were self-reported, preventing the formation of a reliable and conclusive result. The article had, however, overcome the limitations in accounting for varying socio-demographic groups and could therefore allow us

to account for varying social norms in the determination of mental impacts as a consequence of vegetarian diets. A prevalence of the onset of depressive symptoms as well as mental disorders such as eating disorders was generally observed to be at greater levels for vegetarians as opposed to omnivores.

Limitations exist throughout studies on the impacts vegetarian diets display, due to the nature of data collection and research methods. The absence of serum cholesterol, fatty acids and vitamin B12 were observed to be unaccounted variables in the study of depressive symptoms as a consequence of a vegetarian diet amongst men, (Hibbeln et al., 2018). Whilst a study into the relationship of vegetarian diets and eating disorder amongst adolescents and young adults understood that the study into the topic to be practically demanding as scarcity of sub-group data and related limitations in data collection prevented causations to be drawn thereby only permitting associations to be highlighted, (Sergentanis et al., 2020). By analyzing these past research data and by utilizing a data collection method that provides an ample and encompassing sample population, definitive results would then be provided.

Study Design

Research Question

The objective of this paper aims to identify the presence of positive and negative effects brought on by the adoption of a vegetarian diet on the physical and mental health of an individual, whilst identifying if the positive impacts would outweigh the negative connotations provided in the observation of a vegetarian diet.

This research paper focuses on the physical and psychological impacts brought about by vegetarian diets. Therefore, the research question would be as follows, "Does the observation of a vegetarian diet provide a beneficial or detrimental impact on one's physical and psychological health?"

Hypotheses

A two-tailed test will be conducted with regards to the hypothesis statements, with the null hypothesis, H_0, observing no impact brought on by a vegetarian diet lifestyle and the alternative hypothesis, H_a, observing negative impacts on one's health as a result of a vegetarian diet lifestyle.

Null hypothesis, H_0: A vegetarian diet lifestyle displays no impact on one's physical and mental health conditions.

Alternative Hypothesis, H_a: A vegetarian diet lifestyle displays an impact on one's physical and mental health conditions.

Data

      A cross-sectional study would be conducted based on currently available secondary data sources presenting figures on the estimated number of vegetarian diet observers within each country on a global scale. Sources such as the World Health Organization, World Bank, Our World in Data & Statista would be utilized during this study due to the relevancy of the information covering multitudes of countries. Two regression tests are conducted to investigate the impacts resulting from the adoption of a vegetarian diet on a population's physical and psychological state respectively.

Population and Sample

      The study aims to examine the global population, to provide a holistic overview of the potential impacts of vegetarian diets whilst accounting for regional differences. Due to limitations in data sources for vegetarian data, the final population size would be restricted to 63 countries (to be noted once access to data from Statista is provided), however, statistics on the other countries with regards to the dependent and control variables would still be provided and examined to aid the efforts of future studies once more data sources on vegetarian diets become accessible. The population of the overall data would then consist of 176 countries, limited based on data availability. Cluster sampling would then be conducted on the 63 countries whereby information on regional adoption of vegetarian diet patterns is available as of the study of this paper.

Variables and Measures

Independent Variable

Dietary Type

Under this section, the vegetarian diet would be the key independent variable. This diet acts as a cause on both the physical and mental health conditions for this study, which will be presented in the dependent variables below. We will be measuring the observation of this dietary type against the physical and mental health conditions of a vegetarian diet, allowing us to visualise a correlation between these factors.

Dependent Variables

Physical Health Conditions

In this section, we are presented with the physical health conditions as one of our dependent variables. The physical health conditions of a human are definitely one important aspect to look into based on the vegetarian diet consumed by the person. The physical conditions we are looking at would be the lifespan of people in every country that would represent and give a gauge of the trend of the human population. We will be measuring the physical health conditions by analysing the life expectancy of the human population in 176 countries worldwide respectively, allowing us to visualise the ages that people are actually living up to.

Mental Health Conditions

In this section, we will present the impacts on mental health as our other dependent variables. There have been findings and research on a possible link between mental health impacts and the adoption of a vegetarian diet. The mental health aspects we will be looking into are the depression cases among the different countries which would give us a gauge of the mental health of the country's population. We will be measuring the mental health conditions by analysing the presence of depressive symptoms of the country's population, 176 worldwide respectively, allowing us to visualise the presence of the depression cases the people may be experiencing.

Control Variables

Variables accounted for within this study to control for their external influences include the mean age, percentage of females, types of lifestyle, gross domestic product (GDP), body mass index (BMI) and cultural indicators of each individual country.

Age

There may be a correlation between age and the detrimental effects of both mental and physical health of one person, the dependent factor in our paper, thus there is a need to include them. A trend of the elderly being increasingly exposed to the effects of failing health and mental disorders may not be a result of their dietary choices (Rosell et al., 2005).

Gender

      The gender of an individual also may affect the factors regarding their physical and mental health. It is a well-known fact that there are more female vegetarians as compared to male vegetarians, whether it is due to their lifestyle, religions or life experience. Furthermore, women have a higher life expectancy as compared to men, thus we can say that gender plays a significant part in determining the effects of vegetarianism on life expectancy (Jian et al., 2014).

Lifestyle

      According to the lifestyle of a person, there are many different types of factors that may affect his or her physical and mental well-being. Some of these factors include the number of hours in which one exercises in a week, the misuse of controlled substances, the adoption of smoking in their lifestyle or even consumption of alcohol in their daily life. In a study on the life expectancy among Japanese, male and female smokers who maintained all other healthy lifestyle factors had shorter life expectancy than those of their current nonsmoking (Tamakoshi et al., 2010). Therefore, adopting a vegetarian diet does not necessarily account for the possible detrimental effects on the physical and mental health of a vegetarian, but rather the way a person lives (Pribis et al., 2010). Since lifestyle is a broad topic with numerous factors being involved, we would utilise the data given from the government websites from our 63 samples of countries. These data would mainly state the overall physical activity on a monthly basis, presence of smoking, consumption of alcohol products, and possible stress levels of people living in each of these 63 countries for the year 2016. Comparing these data across the 63 countries would give us a better insight into establishing a more precise conclusion on the effects of these potential control variables.

Socioeconomic Status

One of the resounding control variables to be discussed is the socioeconomic status of a country. The status of every country is determined by its GDP, which encompasses the general productivity of them achieving greater success. People who live in a country of lower socioeconomic status might be more prone to depression due to lower household assets, debts, food insecurity, etc. In addition, it was found that people who experience food insecurity in low-income countries are associated with poorer mental health status (Jones A. D. PhD., 2017). Therefore, the factor of socioeconomic status does come into play, where it accounts for the amount of stress that it has on the people in each country, and we note that this factor would have its corresponding part to play in affecting how a vegetarian diet could bring about positive or detrimental effects (Allès et al., 2017).

Nutritional Data

The US Centre for Disease Control and Prevention (CDC) has recognized the utilization of BMI as a reasonable indicator of body fat, allowing it to be utilized as a measure of a population's weight status, (Centre for Disease Control and Prevention, n.d.). Whilst obesity does not directly cause any of the potential health impacts such as heart diseases, stroke and diabetes, it has been attributed to increasing the likelihood of occurrence, (Ritchie, 2017). As such, average values of a country's Body Mass Index (BMI) will be utilized to estimate a country's caloric intake whilst considering possible lifestyle implications. The variable would allow us to account for unnatural dietary intake structures leading to obesity or malnourishment that may affect the mental and physical states of the global population.

Cultural Indicators

In terms of cultural indicators, it is one of the many control variables that could be present, affecting the mental well-being of the individual. With the numerous countries in the world, there are certainly countless cultures that people are being brought up with, and the specific values, beliefs, and behaviours that are being inculcated to them. It was found that blacks report lower levels of life satisfaction, happiness, marital happiness, and higher levels of anomie and mistrust than whites (Jackson et al., 2004), which might be due to the discrimination and isolation caused by their culture. Hence, the variation of cultures could be a key factor in affecting human health physically and mentally. We would separate the samples into their respective continents (Asia, Africa, North America, South America, Antarctica, Europe, and Australia) as a measure to broadly account for differences in cultural values.

Data Collection Method

To measure the impact vegetarian diets may hold on physical and psychological states, we have chosen the measures of life expectancy and prevalence of depression respectively. Cross-sectional data on these variables alongside the key independent variable as long term observations are required to identify plausible correlation and statistical significance due to the nature of the variables only showing a change after an extended period of time. This study would therefore form a baseline for continued observations to form going forth upon the presence of data availability.

Data from the year 2016 on the variables have been extracted and sourced from global organizations such as the World Health Organization, World Bank and Our World in Data, with the data set on the population of vegetarian diet observers sourced from Statista as the study proceeds.

Life Expectancy

Global life expectancy figures were extracted from the World Bank's database wherein data was compiled in the 2019 revision of the United Nations World Population Prospects, census reports from national organizations and other statistical divisions.

Life expectancy at birth, total (years)	
Mean	71.9826753
Standard Deviation	7.70146169
Minimum	51.593
Maximum	83.98487805
Count	176

Figure 1: Global life expectancy figures (By Country) for the year 2016

Prevalence of Depression

Prevalence of depressive disorders (Number of depression cases) by each country were extracted from the database of Our World In Data which utilized the Global Burden of Disease Study 2017 (GBD 2017) and Institute for Health Metrics and Evaluation (IMHE 2018) findings to present its data. However, due to a difficulty in ascertaining the prevalence of depression disorders diagnosed and/or reported around the world, the data sets may not be the absolute figures of the number of depression cases worldwide. As it is still one of the most comprehensive and detailed data sets available in this study, it has been determined to be within the research's margin of tolerance.

Prevalence - Depressive disorders - Sex: Both - Age: All Ages (Number)	
Mean	1445772.118
Standard Deviation	5561936.864
Minimum	1469.432166
Maximum	55978079.03
Count	176

Figure 2: Estimated figures of depressive disorders (By country) for the year 2016

Body Mass Index (BMI)

Mean BMI values per country were derived from the World Health Organization, the data set utilized the sampling of civilians, both males and females, aged 18 and above on a per-country basis to determine an estimation of the global mean BMI figures.

BMI	
Mean	25.79147727
Standard Deviation	2.277664488
Minimum	20.5
Maximum	31.9
Count	176

Figure 3: Global mean BMI figures (By country) for the year 2016

Gross Domestic Product (GDP)

The measure of socioeconomic status utilized GDP per capita for each individual country, values represented within the study are valued using US dollars. Statistics on this data set were sourced from the world bank's and OECD's national accounts data files.

Gross Domestic Product (USD)	
Mean	4.20343E+11
Standard Deviation	1.72975E+12
Minimum	178328873
Maximum	1.8715E+13
Count	176

Figure 4: Gross Domestic Product (By Country) for the year 2016

Data Analysis Method

The chosen method to better perceive and analyse the data correlation between the chosen independent variable and the dependent variable would be the regression analysis. We would be able to find out the magnitude of the results, the direction of the corresponding impact, and the other control variables we identified that are potentially a cause to the mentioned variables we are targeting. We hope to establish and construct regression equations that could give the audience a better apprehension of the said variables, while concurrently broadening their view on how vegetarian diets could result in amplifying or reducing the impact on physical and mental health. The regression equations are stated below.

Regression Analysis for Vegetarian Diet to Life Expectancy and Depression Cases

$$Y_i = \alpha + \beta 1 X 1_i + \beta 2 X_i + \varepsilon_i$$

Y_i=Life Expectancy/Depression Cases (dependent variables-effect),

α=Y-intercept upon plotting graph,

$\beta 1$ and $\beta 2$= size and direction of impact of the Vegetarian Diet on Life Expectancy/Depression Cases,

$X 1_i$=Vegetarian Diet (independent variable-cause),

X_i = All six control variables accounted (Age, Gender, Lifestyle, Socioeconomic Status, Nutritional Data, Cultural Indicators),

ε_i= Error term (residual-distance between the specific data point and linear red line)

The regression equation would certainly improve the accuracy of our results and expand the approach in viewing the targeted problem. The accountability of the mentioned control variables was of utmost importance, where there is an essential need to identify and insert them into the regression equation. This action acts as a justification measure to tell the audience that there are several factors that are answerable to the effects of a vegetarian diet and that we are not neglecting these important variables by including their inputs into the equation.

At any one point, with the vegetarian diet independent variable and six control variables staying constant, the regression equation above would either include the life expectancy dependent variable or the number of depression cases as the other dependent variable. Upon approval for funding of this proposal, the results of implementing the equation above would enable us to get hold of the P-value, Coefficients, and R-square values. Capturing these values by then would give us more insights into the understanding of the nature of the vegetarian diet. To give more context, a p-value below 0.05 would mean data is statistically significant and would require us to look at the coefficient value to better determine the size and direction of impact, either from a vegetarian diet to affecting life expectancy or from a vegetarian diet to affecting the number of depression cases. Further insights and trends of the research could be better investigated with these values, allowing us to know the extent of the results and the fitting of data points in each equation.

Limitations

One of the key limitations of our research is the lack of more concise vegetarian diet data across all 176 countries to fully substantiate our research. The data presented in previous findings and articles were generally insufficient, as we understand that the current subject is relatively niche or even desisting. The most relevant data found on vegetarian diets around the world only showed and segmented various regions in a specific year as is located on Statista's graphical representation "Share of people who follow a vegetarian diet worldwide as of 2016, by region". Furthermore, the data were presented in percentage, wherein exact numerical data on the tested 63 countries were not made available to the common public. As a result, our research, at this stage, may provide difficulties in establishing precise and exact results to a certain extent. Requiring continued long term research to be conducted on this topic as long term effects of vegetarian diets are not presented in short term sequences.

Additionally, data sets utilized within this study can only display possible correlation and statistical significance on a macro level due to the nature of the aggregate data, thereby limiting the study from identifying individual attribution of the variables on a micro-level. As such this study recognizes the necessity for corresponding research to be conducted to identify micro-level attribution but remains interested in identifying the effects of vegetarian diets on a global scale for now.

Conclusion

In conclusion, the current research we have mainly aimed to provide more insights and data trends that could be beneficial to increasing people's awareness of a vegetarian diet. The steps and analysis mentioned in the above sections are the current possible presentation of data that could be examined. Upon approval of funding for this research to occur, more in-depth research would be done to ensure more reliability and substantial data to be potentially reported. Also, if funded, this research project of this niche subject could act as a fundamental vegetarian dataset or reference for future researchers to continue possible enhanced research.

To amplify our research objectives, it could bring about positive changes to the world's government policies, adding more health emphasis in their respective education system by inculcating important healthy habits and behaviours to expose the younger generation to understand how diets may play an impactful role in their lives. Additional policies to encourage healthy habits at the workplace, increase conversations on vegetarian diets around the world and thus increase awareness of the importance of physical and mental effects of the diet. Thus, we hope that the research would be able to change and better the world, in terms of providing substantial information on healthy eating, reliable statistics of vegetarian diets around the world, possible causation of physical and mental health issues from vegetarian diets, and any corresponding issues that are directly associated with vegetarian diets.

References

Allès, B., Baudry, J., Méjean, C., Touvier, M., Péneau, S., Hercberg, S., & Kesse-Guyot, E. (2017). Comparison of Sociodemographic and Nutritional Characteristics between Self-Reported Vegetarians, Vegans, and Meat-Eaters from the NutriNet-Santé Study. *Nutrients*, *9*(9), 1023. https://doi.org/10.3390/nu9091023

Appleby, P. N., & Key, T. J. (2015). The long-term health of vegetarians and vegans. Proceedings of the Nutrition Society, 75(3), 287–293. https://doi.org/10.1017/s0029665115004334

Bedford, J. L., & Barr, S. I. (2005). Diets and Selective Lifestyle Practices. *International Journal of Behavioral Nutrition and Physical Activity*, *2*(1), 4. https://doi.org/10.1186/1479-5868-2-4

Centre for Disease Control and prevention. (n.d.). *Body Mass Index: Considerations for Practitioner*. https://www.cdc.gov/obesity/downloads/bmiforpactitioners.pdf

Domke, F. (2018). Vegetarian and vegan products - labelling and definitions. European Food and Feed Law Review : EFFL, 13(2), 102-107. http://ezproxy.libproxy.db.erau.edu/login?url=https://www-proquest-com.ezproxy.libproxy.db.erau.edu/scholarly-journals/vegetarian-vegan-products-labelling-definitions/docview/2101922301/se-2?accountid=27203

Hibbeln, J. R., Northstone, K., Evans, J., & Golding, J. (2018). Vegetarian diets and depressive symptoms among men. *Journal of Affective Disorders*, *225*, 13–17. https://doi.org/10.1016/j.jad.2017.07.051

Jackson, J.S., Torres, M., Caldwell, C.H., Neighbors, H.W., Nesse, R.M., Taylor, R.J.,

    Trierweiler, S.J. and Williams, D.R. (2004), The National Survey of American Life: a

    study of racial, ethnic and cultural influences on mental disorders and mental health. Int.

    J. Methods Psychiatr. Res., 13: 196-207. https://doi.org/10.1002/mpr.177

Jian, Z. H., Chiang, Y. C., Lung, C. C., Ho, C. C., Ko, P. C., Ndi Nfor, O., Chang, H. C., Liaw,

    Y. C., Liang, Y. C., & Liaw, Y. P. (2014). Vegetarian diet and cholesterol and TAG

    levels by gender. *Public Health Nutrition*, *18*(4), 721–726.

    https://doi.org/10.1017/s1368980014000883

Jones, A. D., PhD. (2017). Food Insecurity and Mental Health Status: A Global Analysis of 149

    Countries. *American Journal of Preventive Medicine*.

    https://doi.org/10.1016/j.amepre.2017.04.008

Kohlenberg-mueller, K., & Raschka, L. (2003). Calcium balance in young adults on a vegan and

    lactovegetarian diet. *Journal of Bone and Mineral Metabolism, 21*(1), 28-33.

    http://dx.doi.org.ezproxy.libproxy.db.erau.edu/10.1007/s007740300005

Lavallee, K., Zhang, X. C., Michalak, J., Schneider, S., & Margraf, J. (2019). Vegetarian diet

    and mental health: Cross-sectional and longitudinal analyses in culturally diverse

    samples. *Journal of Affective Disorders*, 248, 147-154.

    https://doi.org/10.1016/j.jad.2019.01.035

Matta, J., Czernichow, S., Kesse-Guyot, E., Hoertel, N., Limosin, F., Goldberg, M., Zins, M., &

    Lemogne, C. (2018). Depressive symptoms and vegetarian diets: Results from the

    constances cohort. Nutrients, 10(11), 1695. https://doi.org/10.3390/nu10111695

Michalak, J., Zhang, X. C., & Jacobi, F. (2012). Vegetarian diet and mental disorders: Results from a representative community survey. The International Journal of Behavioral Nutrition and Physical Activity, 9(1), 67-67. https://doi.org/10.1186/1479-5868-9-67

Our World In Data. (n.d.). *Number of people with depression by country*. https://ourworldindata.org/grapher/number-with-depression-by-country

Pribis, P., Pencak, R. C., & Grajales, T. (2010). Beliefs and Attitudes toward Vegetarian Lifestyle across Generations. *Nutrients*, *2*(5), 523–531. https://doi.org/10.3390/nu2050523

Ritchie, H. (2017, August 11). *Obesity*. Our World in Data. https://ourworldindata.org/obesity

Rosell, M., Appleby, P., & Key, T. (2005). Height, age at menarche, body weight and body mass index in life-long vegetarians. *Public Health Nutrition*, *8*(7), 870–875. https://doi.org/10.1079/phn2005730

Segasothy, M., & Phillips, P. (1999). Vegetarian diet: panacea for modern lifestyle diseases? QJM, 92(9), 531–544. https://doi.org/10.1093/qjmed/92.9.531

Sergentanis, T. N., Chelmi, M.-E., Liampas, A., Yfanti, C.-M., Panagouli, E., Vlachopapadopoulou, E., Michalacos, S., et al. (2020). Vegetarian Diets and Eating Disorders in Adolescents and Young Adults: A Systematic Review. Children, 8(1), 12. MDPI AG. http://dx.doi.org/10.3390/children8010012

Tamakoshi, A., Kawado, M., Ozasa, K., & Tamakoshi, K. (2010). Impact of Smoking and Other

Lifestyle Factors on Life Expectancy among Japanese: Findings from the Japan

Collaborative Cohort (JACC) Study. Journal of Epidemiology /, 20(5), 370–376.

https://doi.org/10.2188/jea.JE20100017

World Bank. (n.d.-a). *GDP (current US$) | Data*. Retrieved May 1, 2021, from

https://data.worldbank.org/indicator/NY.GDP.MKTP.CD

World Bank. (n.d.-b). *Life expectancy at birth, total (years) | Data*.

https://data.worldbank.org/indicator/SP.DYN.LE00.IN