THE INTERNATIONAL JOURNAL OF HUMANITIES & SOCIAL STUDIES

Need for Women in Statistics and Data Science in Nigeria

Adehi Mary Unekwu

Lecturer, Department of Statistics, Nasarawa State University, Keffi, Nigeria

David Ikwuoche John

Lecturer, Department of Mathematics & Statistics, Federal University, Wukari, Nigeria

Abstract:

This paper was delivered at a webinar on zoom meet on 20th June 2020, in consideration for the involvement of women in statistics and data science in Nigerian society, towards a better, stronger economy and life for its citizens. The theme was, 'Capacity Building on Consulting Best Practices Technique for Women in Statistics and Data Science in Nigeria', we had in attendance, some notable female statisticians that have been mentioned here as well as students of tertiary institutions. The high point of the paper is in the contributions some of the notable female statisticians have made already and those made by other women who have been empowered and have distinguished themselves. It is therefore convincing to note that women have done it, they are still doing it, and would do more if empowered.

Keywords: Women, statistics, data-science

1. Introduction

Data Science is the study of data, it involves developing methods of recording, storing, and analyzing data to effectively extract useful information (Techterms, 2017).

Data mining on the other hand, is often confused with data science because it involves analyzing large amounts of data (big data) that is derived from data science but, the two are different. While data Science seeks to gain insights and knowledge from structured and unstructured data by creating stochastic models, data mining seeks to discern trends and patterns through exploring increasingly large databases and to improve market segmentation.

Data Science is an inter-disciplinary field that uses scientific methods, processes, algorithms and systems to extract knowledge and insights from many structured and unstructured data, it is the technology that handles and works with data in this 21st century (Wikipedia, Data Science, 2020); The world is becoming a digital space, and organizations deal with zettabytes and yottabytes of structured and unstructured data every day. Storage of critical data requires technologies to enable cost savings and smarter storage spaces. Skilled and certified data scientists are currently needed in industries around the globe and are among the highest-paid professionals in Information Technology (IT) industry, with an average annual salary of \$110,000 in America (Intellipaat, 2016).

Statistics is the science of collecting, organizing, analyzing, presenting and interpreting data; Data preparation, munging and process algorithms are necessary for data science; Data modeling is the process of producing a descriptive diagram of relationships between various types of information that are stored in a database, *and so, without Statistics, modeling, scientific methods and algorithms, data as well as data science is meaningless.*

Hence, data science is in the middle of statistics, scientific methods, modeling and algorithms as seen in Figure 1. *In my opinion, it will be correct to say that data science is statistics, because in statistics, data is used for/with scientific methods, modeling and process algorithms.*

Figure 1: Data Science as an Inter-Disciplinary Field

Source: (Intellipaat, 2016)

2. Methodology & Results

In Nigeria, the National Bureau of Statistics (NBS), is a major hub for dissemination of statistical data with a wide range of functionalities (NBS, 2020). To achieve the overall goal of NBS and satisfy the need for data in all aspects of our economy, it is important that a digital strength is obtained through government's intervention, the need for data cannot be over emphasized; Students at all levels of tertiary education will encounter the need for data in carrying out research or simple worked illustrations for learning.

The health sector equally harnesses data for government interventions.

Supermarkets make use of data to enhance effective sale of goods, based on demand and supply, and to ensure customer satisfaction.

Banks work with data to do a whole lot of transactions that benefit the customers and maximize profit for the overall achievement and goals of the sector. Without data Science providing soft-ware for the management of big data, global advantage cannot be achieved in banking and fraud would be rampant.

Agriculture is in need of data science to transcend effectively to mechanized farming and genetically modified (GMO) foods.

Aviation industry depends largely on data to track passengers and payment for tickets, flight schedules, baggage control, flight menu, weather conditions etc.

Schools make significant use of data to capture population of parents, students and pupils; record of performance for students and pupils; staff population and biodata; payment of salaries etc.

Religious organizations make use of data to take census of their members as well as effective daily administrative control.

Affirmative policy on gender equality dates back to the Beijing fourth World Conference in China, 4th-15th September 1995, 'Women: Action for Equality, Development and Peace' was the theme of the conference; following this conference, women have continued to advocated for a higher percentage of inclusiveness in the work force in society. However, the current records do not represent gender equality but have transcended to a remarkable increase in many parts of the globe (UN, 2014).

Women in Canada hold 88 (26%) of the 338 member House of Commons (Catalyst, Women in the Work Force- Canada: Quick Take, 2019); In The United States of America, women hold 101 (23.2%) of the 435 seats (88 Democratic, 13 Republicans), the men hold 76.8%; In the Senate, they hold 26 (26%) of the 100 seats (17 Democratic, 9 Republican), the men hold 74% (Catalyst, Women in Government: Quick Take, 2020); In The United Kingdom, the involvement of women over time ranges between 13.6% to 34.8%, it is currently 27.3% (Clark, 2020).

It is not in doubt that even though these countries (Canada, US and UK) are thriving well in digital economy, despite the discrimination against women involvement, a raise in the figures to allow more participation of women may yield more growth because women can, and have made notable achievements over time.

The Nigerian government, in line with the national gender policy, requires a minimum of 35% female representation on the President's cabinet, however, there is a violation of this requirement due to the traditional discrimination against women (Oluyemi, 2016). It then becomes necessary for women in various works of life to speak out, heighten their efforts and specialization to enable inclusiveness in government toward policy and national decisions. It is to this end, that we consider the issue and topic on 'The Need for Women in Data Science and Statistics', to raise our voice in protest to this salient discrimination against the female gender in many aspects of life, and appeal for inclusiveness in government policy decisions.

In a bid to show that women, if empowered, will give their best, it is therefore necessary to consider some notable contributions made and reviewed by women. In Canada, some women have contributed to statistical theory, following the 1970 recommendation of the Royal Commission on the status of women that gender-based discrimination be prohibited across Canada (Billard L., 2015). Over the years, Canada has made considerable strides towards gender equality. In 2018, Canadian Women 15 years and older represented nearly half (47.7%) of the labour force. From \$1520 USD Billion in 2016, Gross Domestic Product (GDP) in Canada is expected to reach \$1760 USD Billion by the end of 2020 (Catalyst, Women in the Work Force- Canada: Quick Take, 2019).

Dr. Estelle Bee Dagum is the originator of the XIIARIMA seasonal adjustment method of time series analysis which was incorporated into X-12-ARIMA which is used in Canada for the seasonal adjustment of key economic indicators such as the Gross Domestic Product (GDP) and unemployment rates.

Priscilla Greenwood is known for her research contributions in stochastic processes. She led a group of mathematicians, statisticians, and subject area researchers in studying physical systems via stochastic dynamic models with critical points.

Agnes M. Herzberg, a renowned researcher in experimental design, and a major connector with leaders in the field, contributed extensively to the theory of optimal experimental design, robust designs, experimental designs for medical experiments and model selection in regression. She has been instrumental in providing a forum for discussion and action in the wider sphere of science and public policy.

Mary Thompson made many important contributions to statistical methods for survey sampling, the theory of estimating equations, and statistical modeling and inference for stochastic processes.

Constance Van Eeden contributed to the statistical community as an Associate Editor for the Annals of Statistics, the Canadian Journal of Statistics, and *Les Annals des Sciences Mathematiques du Quebec*, as a General Editor of Statistical Theory and Methods Abstract, as well as an active member of many committees and research councils.

Bringing home (Nigeria), the notable female statisticians, Prof. Joy C. Nwabueze is the Deputy Vice-Chancellor (Administration) at Michael Okpara University of Agriculture, Umudike, Nigeria. She is the first female professor of statistics in Nigeria and also the first female Deputy Vice-Chancellor (Administration) of the university, she is known for setting a record of firsts. Her contributions in statistics are in Econometrics, Multivariate Analysis and Mathematical Statistics. She has over 60 publications in peer-reviewed journals and books. She has offered consultancy services to several universities and organizations in Nigeria (Portal, 2020).

Prof. Ekaete Enang Inyang is a professor of statistics at the university of Calabar, she is a seasoned survey statistician, skilled in developing statistical methodology with several published articles and community development experiences. She is an excellent administrator with good interpersonal relationship and committed to mentoring independent and seasoned professionals that can solve real life problems (Directory, 2020).

Dr. Angela Chukwu is an Associate Professor at the university of Ibadan, she has over fifteen years' experience of teaching research in statistics with applications in the life sciences and public health. She is proficient in classical methodologies including experience in the analysis of experimental data, using parametric and non-parametric methods, sampling and sample size estimation, mathematical demography, survival analysis and probability. She is committed to mentoring and facilitating international partnerships on research for national development (Linkedin, Angela Chukwu, 2020).

Dr. Mary Pascal Iwundu is an Associate Professor at university of Port-Harcourt, Nigeria, she has interest in optimal designs and response surface methodology. She is committed to mentoring students in all levels of the tertiary education in Nigeria (ResearchGate, Mary Iwundu, 2020).

Dr. Happiness Obiora-Ilounu is an Associate Professor at Nnamdi Azikiwe university Awka, she is proficient in operations research, computational statistics and regression analysis (ResearchGate, Happiness Obiora-Ilounu, 2020).

Dr. Chinelo Igwenagu is an Associate Professor at Enugu State university of Science and Technology. She is the Head of Department of Industrial Math and Statistics and a principal consultant, Merc Data Consulting on research methodology and data analysis (Linkedin, Chinelo Igwenagu, 2020).

Many other female statisticians are working hard and are available for training in data science and inclusiveness in government policy decisions. It will appear as though many of such, and a wide range of other disciplines, are working daily in the background, performing roles, while men are applauded for excellence.

In other fields of study, we have had women tackle difficult problems; Apart from their expertise and specialization, these women we will mention, were empowered to serve the society, they have been tried and tested, have distinguished themselves by their performance, and they have shown that women can make changes in the positive direction:-

Ngozi Okonjo Iweala, is a renowned economist, she has contributed to national as well as international goals; she occupied a seat on the board of Standard Chartered Bank, Twitter, Global Alliance for Vaccines and Immunization (GAVI), and the African Risk Capacity (ARC); She served two-terms as Finance Minister of Nigeria (2003-2006, 2011-2015), and spent 25-year career at the World Bank as a development economist, and presently nominated for office of Director General, World Trade Organization (WTO) (Wikipedia, Ngozi Okonjo-Iweala, 2020).

Mrs. Abike Dabiri-Erewa, The Chairman/ Chief Executive Officer of the Nigerians in Diaspora Commission, worked effectively with the Presidential Tax Force (PTF) on covid-19 to evacuate Nigerians in diaspora at a time that hope was lost on our national strength (BizWatchNigeria, 2020).

The Minister of Finance, Zainab Shamsuna Ahmed- an economist, with her knowledge and diverse experience in public sector reform and management, played her role to keep the Nigerian economy stable during this ravaging pandemic in the face of global disruptions (Eagle, 2020).

The Minister of Humanitarian Affairs, Disaster Management and Social Development, Sadiya Umar Farouk, made haste to play a role in the distribution of palliatives from Federal Government to citizens during covid-19 (Abdulrahman, 2020).

Dame Pauline Kedem Tallen OFR, the Minister of Women Affairs and a Sociologist, in her political journey and a plethora of awards, has made her contribution to the nation through self-help projects involving women (Foundation, 2020). She is presently speaking up against gender-based violence: rape, sexual exploitation, child molestation, sexual violence against women and children (Nigeria, 2020).

Prof. Mojisola Christianah Adeyeye, a Pharmacist and Professor, and the Director General, National Agency for Food and Drugs Administration and Control (NAFDAC), in the discharge of her duties, and among her many contributions to national goals, contributed towards the safety of food additives in consideration of scientific data to support standards as well as Standard Operating Procedures (SOP) (NAFDAC, 2018).

A cofounder of the 'bring back our girls' movement, a former Nigerian Minister, and former Vice President for Africa at the World Bank, Obiageli Ezekwesili, despite effective involvement in her primary duties, pursued the dream of bringing the Chibok girls back with all her might; six years gone, but her contribution is notable in the awareness she created, that is still fresh with fervent hope that one day, the remaining 112 girls will re-unite with their families (Obiezu, 2020).

3. Discussion & Conclusion

During this advent of covid-19 pandemic, Canada, the United States of America and the United Kingdom were among the countries around the world tackling the virus effectively, with the use of data and science. They have in their cabinets, 26% (Catalyst, Women in the Work Force- Canada: Quick Take, 2019), 24% (Catalyst, Women in Government:

Quick Take, 2020) and 27.3% (Clark, 2020) of women respectively. If the required minimum of 35% of women were involved in the Nigerian Government, they may have complimented all the effort thus far, to get past the novel virus. I am optimistic that if women in data science and statistics who have distinguished themselves, and others are trained for specialization in data science and statistics, and are given the empowerment that is required, a time of pandemic such as covid-19 could have been an era of critical decision making through data and science as was/is the case, in Canada, the United States of America and the United Kingdom.

If women are gainfully empowered and involved in data science and statistics, the Nigerian economy and policy decisions may take a positive turn around into an era of digital economy.

'A woman is a complete circle of life, she is the most beautiful being that life has been blessed with, she is unique in many ways, innocent, and has a strong will power to overcome the hurdles of life.' (Garg, 2018).

The nature of a woman, endears her to be a problem solver, she imbibes her qualities such as: *A belief in oneself; A willingness to nurture; A focus on achieving one's goals; Building and leading teams; Willingness to question the status quo; and Brevity to ask for help* (Board, 2017), to enable her actualize targets that her male counterparts would ordinarily ignore. As such, in the world that craves earnestly for data science and statistics in solving major problems affecting the economy, there is an insurmountable need for women to collaborate with men in a way that will yield greater national goals.

Funding is also a major need in encouraging the involvement of women in data science and statistics, the use of machines, software, training of personnel, and acquisition of structures for a laboratory is capital intensive and would require the keen attention of government.

Nigeria needs to empower notable female statisticians through leaders of recognized national and international statistical associations or societies into government policy decision making, as well as train and graduate more female statisticians, by giving scholarship, to encourage and alleviate the fears of young women who think that Statistics is a difficult subject, to motivate their interest in the field as well as promote their interest in establishment of data science laboratories/companies.

It will be gratifying, if this paper yields essential reforms in Nigeria, in line with inclusiveness of women in government for a digital economy and the overall achievement of National goals.

4. Acknowledgements

- LISA 2020 Network Program.
- Dr. M. O. Adenomon, Coordinator, NSUK-LISA, Department of Statistics.
- Prof. J. C. Nwabueze, Michael Okpara University of Agriculture, Umudike, Nigeria.
- Prog. J. I. Mbegbu, University of Benin, Nigeria.

5. References

- i. Abdulrahman, H. (2020, May 6). NGO tracks palliatives distribution. Retrieved from Radio Nigeria: <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwj3pLZqoTqAhUS8BQKHbsBAYkQFjADegQIBBAB&url=https%3A%2F%2Fwww.radionigeria.gov.ng%2Ftag%2Fminister-of-humanitarian-affairs-disaster-management-and-social-development-h>
- ii. Anonymous. (2020, April 4). Stranded Nigerians in Diaspora to pay for Evacuation. Biz Watch Nigeria.
- iii. Billard L., K. K. (2015). Women in Statistics: Scientific Contributions Versus Rewards. In: Pearson, Jr. W., Frehil L., McNeely C. (eds) (International Perspective ed.). Springer, Cham.
- iv. BizWatchNigeria. (2020, April 4). Stranded Nigerians in Diaspora to pay for Evacuation. Retrieved April 4, 2020, from <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEWjWj-TvryTqAhU0DmMBHaASAogQFjAAegQIAxAB&url=https%3A%2F%2Fbizwatchnigeria.ng%2Fstranded-nigerians-in-diaspora-to-pay-for-evacuation-says-abike-dabiri-erewa%2F&usg=AOvV>
- v. Board, T. A. (2017, February 7). 6 qualities that successful Women Leaders Typically Possess. Retrieved February 7, 2017, from 6 qualities that successful Women Leaders Typically Possess: <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwic2seCsITqAhW2DmMBHeELC4sQFjAAegQIBBAB&url=https%3A%2F%2Fwww.thealternativeboard.com%2Fblog%2F6-qualities-of-effective-women-leaders&usg=AOvVaw3IK7ix790UpjXBHKbleBD8>
- vi. Catalyst. (2019, May 28). Women in the Work Force- Canada: Quick Take. Retrieved May 28, 2019, from <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiT4sDIsITqAhX6BGMBHdwQD4QQFjAAegQIBBAB&url=https%3A%2F%2Fwww.catalyst.org%2Fresearch%2Fwomen-in-the-workforce-canada%2F&usg=AOvVaw27Or6BDC47TNm9s5o-RewQ>
- vii. Catalyst. (2020, March 9). Women in Government: Quick Take. Retrieved March 9, 2020, from Catalyst: <https://www.catalyst.org/research/women-in-government/>
- viii. Clark, D. (2020, May 18). Proportion of Female Cabinet Members in Governments of the UK from 2004-2020. Retrieved May 18, 2020, from Statista: <https://www.statista.com/statistics/870238/proportion-of-women-in-uk-cabinets/>
- ix. Directory, U. o. (2020). Dr. Ekaete Inyang Enang. Retrieved 2020, from <https://www.unical.edu.ng/staff/user/profile-enang-inyang>

- x. Eagle, T. (2020, May 22). Covid-19 Economic Stimulus: States to get \$1.5b from World Bank-NEC. Retrieved May 22, 2020, from Nigerian Investment Promotion Commission:
<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwid8laCrYTqAhWB5OAKHRMuCocQFjAAlegQICRAB&url=https%3A%2F%2Fnipc.gov.ng%2F2020%2F05%2F22%2F2020-economic-stimulus-states-to-get-1-5b-from-world-bank-nec%2F&usg=AOvVa>
- xi. Foundation, C. (2020). Her Excellency, Dame Pauline Kedem Tallen. Retrieved from <https://cofpfoundation.org/her-excellency-dame-pauline-kedem-tallen/>
- xii. Garg, S. (2018, march 15). which thing makes a woman unique? Retrieved from which thing makes a woman unique?:
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiPgvz2qYTqAhVV8eAKHavkAI8QFjAAegQIARAB&url=https%3A%2F%2Fwww.quora.com%2FWhich-thing-makes-a-woman-unique&usg=AOvVaw1C_aG_AmfK7wRVrIE1eW7c
- xiii. Intellipaat. (2016, November 24). What is Data Science. Retrieved November 24, 2016, from <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwikisngyoHqAhUID2MBHSDdBcoQFjACegQIARAB&url=https%3A%2F%2Fintellipaat.com%2Fblog%2Fwhat-is-data-science%2F&usg=AOvVaw3GMbEcCvImzVRnkbDhzDZZ>
- xiv. LinkedIn. (2020). Angela Chukwu. Retrieved from <https://www.linkedin.com/in/angela-chukwu-579174b/?originalSubdomain=ng>
- xv. LinkedIn. (2020). Chinelo Igwenagu. Retrieved from <https://www.linkedin.com/in/chinelo-igwenagu-87484a77/?originalSubdomain=ng>
- xvi. NAFDAC. (2018). DG, NAFDAC attended the 41st CAC in Rome, Italy. Retrieved July 7, 2018, from <https://www.nafdac.gov.ng/director-general-national-agency-for-food-and-drug-administration-and-control-nafdac-prof-mojisola-christianah-adeyeye-attended-the-41st-session-of-the-codex-alimentarius-commission-cac-in-rome/>
- xvii. NBS. (2020). Data Analysis-National Bureau of Statistics. Retrieved from nigerianstat.gov.ng:
<https://nigerianstat.gov.ng/page/data-analysis>
- xviii. Nigeria, N. N. (2020). Tallen Advocates Special Court to Prosecute Rape Cases. Retrieved June 8, 2020, from <https://nnn.com.ng/tallen-advocates-special-court-to-prosecute-rape-cases/>
- xix. Obiezu, T. (2020). Nigeria Marks 6th Year of Missing Chibok Girls Amid Coronavirus Pandemic. Retrieved April 14, 2020, from <https://www.voanews.com/africa/nigeria-marks-6th-year-missing-chibok-girls-amid-coronavirus-pandemic>
- xx. Oluyemi, M. O. (2016, October). Monitoring Participation of Women in Politics in Nigeria. Retrieved from https://unstats.un.org/unsd/gender/Finland_oct2016:
https://unstats.un.org/unsd/gender/Finland_Oct2016/Documents/Nigeria_paper.pdf
- xxi. Portal, M. (2020). Prof. Joy C. Nwabueze, Michael Okpara University of Agriculture, Umudike. Retrieved from <https://mouau.edu.ng/staff/prof-joy-c-nwabueze>
- xxii. ResearchGate. (2020). Happiness Obiora-Ilouno. Retrieved from https://www.researchgate.net/profile/Happiness_Obiora-Ilouno2
- xxiii. ResearchGate. (2020). Mary Iwundu. Retrieved from https://www.researchgate.net/profile/Mary_Iwundu
- xxiv. Techterms. (2017, august 17). Home: Technical Terms: Data Science Definitions. DATA SCIENCE. Retrieved August 17, 2017, from https://techterms.com/definition/data_science
- xxv. UN. (2014). Beijing Declaration and Platform for Action (2014 ed.). United Nations: UN Women.
- xxvi. Wikipedia, t. f. (2020, June 13). Retrieved June 13, 2020, from Ngozi Okonjo-Iweala:
https://en.wikipedia.org/wiki/Ngozi_Okonjo-Iweala
- xxvii. Wikipedia, t. f. (2020, June 14). Data Science. Retrieved June 2020, 2020, from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwi5-p3cs4TqAhWQ3eAKHdFzAlOQFjAAegQIAXAB&url=https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FData_science&usg=AOvVaw3Xw0xDUCso2wutvPWxmK1M