Opinion Article

CAUSALITY AND CAUSAL EXPLANATION:

The Constitution of Sufficient Reasoning in Social Research.

Abstract

As Social Researcher, I have for the last one and half decades witnessed a disturbing lag in the existing body of literature for causal explanations. The majority seem to contradict and provide no clear-cut explanations about the relevancy of applying causal techniques to understand social patterns. Much as it is true that understanding social processes and patterns is in many ways more challenging than understanding the physical world, social researchers need to provide a justification to these complexities through scientific inquiry using causal techniques and interpretations. Many times social researchers concentrate on the simple linearity between cause and effect and yet its ability to explain reality is doubtable. This sounds to reason that, our focus as social experts should be on what form of social interactions extend over time in the social world to establish the links between cause and effect. Again, how relevant is the available evidence to claim that social factor X causes a change in social factor Y? In other words, is social factor Y a function of social factor X? To establish a scientific conclusion and perhaps shed light on why things in the social world are the way they are, one must logically identify a competent X that can independently predict a change in Y through covariates. In light of this, social researchers can vividly offer logical explanations to various social processes which often seem to be beyond human description.

In this paper, the researcher offers a scientific explanation concerning the various errors in reasoning within the social world and provide a distinction between various types of social explanations, articulate causal

reasoning behind social processes, events and patterns in order to draw conclusions that are based on evidence.

Key words: *(Causality, counterfactual, causal space, causal chain, equifinality, sufficient vs. necessary)*

Introduction

The social world is increasingly getting turbulent, unpredictable and dynamic at the same time and thus survival calls for curiosity of the mind. Need for immediate answers to the emerging turbulent social processes has blindfolded social researchers, journalists, observers and investigators to comfortably draw conclusions that are based on simplistic observable cases. Expert knowledge has little value when simple questions are not asked first, there is need to understand a detailed account of patterns that surround a given event so as to infer with some confidence. Within this context and with specific attention to any phenomenon under investigation, the investigating team has to find out if this particular phenomenon has ever happened before, how it happened, its impact, and whether the same phenomenon is a competent antecedent to the current issue under investigation (Kamila, 2014). Additionally, need is sought to explain a mechanism of how a cause(s) worked in relation to other factors so as to predict the problem under examination. This article offers a scientific explanation concerning the various errors in reasoning within the social world and provide a distinction between various types of social explanations, articulate causal reasoning behind social processes, events and patterns in order to draw conclusions that are based on evidence.

Causality Under Siege

For many years, both scientists and statisticians were reluctant to even say the word “causation.” Judea Pearl (2000), almost single-handedly, has returned the concept of causality to the parlance of scientific discourse. Much as it is claimed by Guo et al. (2010) that, establishing causality is nevertheless a more difficult task, most available research outputs on causality lack the rigor demanded by causal studies (David et al, 2004). Confusion between correlation and causality is dominating the social realm and less effort is so far made to sort this lacuna. This is justified by the number of studies published by several publishing houses with conflicting statistical inferences and interpretations. In causality, the core issue would be on proving that there is no third set of factors creating a spurious relationship between X and Y if the target is to establish simple linearity (Handy et al. 2006). In whatever case, three main elements need

utmost attention in causal studies thus; time presidence, relationship and nonspuriousness (Joseph, 2004, David, 2004, & Fred, 2019). Despite these rules, social researchers have continued to apply correlational statistics for causal studies and vice versa (Rachel C. et al. 2014)

It is quite regrettable that social researchers usually use unsuitable techniques to explain and describe complex social processes, events, phenomenona, and patterns (Fred, 2019). Hardly can social researchers explain why their research space is being abused, Brechman et al (2009), spurious and exaggerated conclusions are taking precedence in the social realm, Cooper et al. (2012), a state that is so undesirable for the future of social research (Haneef, et al. 2015).

Notably, social researchers fluently relate with associations between variables, but hardly can they determine how variables at play affect each other (Aditi et al. 2019). This oversimplification of analysis, has with no doubt hatched a bedrock of misguiding conclusions that have made academia a centre of mockery today (Pearl et al. 2018). How can we predict the future, understand social interactions, events and phenomenona around us with skewed mastery of causal analysis (Judea, 2018)? How can social researchers be blindly confident to apply associations for causality to analyze events which in actual sense would be best understood by the use of causal techniques (Karl J. 2003)! Philosophers and statisticians undoubtedly know causality, but entering into the philosophical and statistical thickets is a daunting enterprise for social scientists because it requires technical skills which the majority may not be trained in (Henry, 2011). It is quite clear that, causality is under serious attack and it's the duty of the social researchers to safeguard the integrity of the social research space by offering interpretations that are guided by appropriate and consistent statistics, theories, and observations.

But most importantly, social researchers need to remember that much as the emphasis from the causal perspective is to identify key explanatory variables, causal philosophies go beyond this. Causality provides no certain path to knowledge, in fact, casual models are only helpful when good ideas are tested (David et al, 2004). Good ideas don't come out of computer packages as most causal researchers seem to think, but from human brains. The duty is to train the mind to deliver ideas that are testable, rather than substituting human reasoning for machine analysis.

Epistemological and Psychological Processes

Evidently observed is a mix of the psychological, epistemological, and ontological arguments of the philosophers when discussing causality (Devroop, 2000). In their attempt to articulate causal reasoning based on their philosophical background, they present a very inconsistent and worrying conceptual perspective whose credence is questionable in the eyes of the practitioners. Competition for attention among the three schools of thought has eventually given birth to misguided academic missiles whose impact on academia has been nothing other than decadency. In this paper for example, the primary purpose is epistemological (truth, belief and justification). The focus is to establish when causality is more truly in effect, rather than using the psychological process to assume that it is operative. Epistemology is concerned with how we can obtain intellectually certain knowledge, what the Greeks called "episteme" (Brady, 2011). How do we figure out that X really caused Y? Using the Ukraine (is it Ukraine, or Ukaine?) Airline crash in Iran dated 08th January 2020, one can practically observe various errors in reasoning premised on the psychological base rather than the underlying factual elements at the critical night of the event in question. Nothing was unusual about the plane's takeoff and ascent, according to preliminary satellite data. But minutes into the flight, the Boeing 737 was engulfed in flames as it plunged to the ground, killing at least 176 people on board (The New York Times, 2020)

In best of circumstances, establishing the cause of an international plane crash is a nightmare, due to scarcity of evidence to draw empirical conclusions. Resolving what happened over the skies of Tehran may prove even more complicated given the tensions between Iran, where the plane went down, and the United States, where it was built by Boeing, a company in the midst of crisis after two earlier deadly accidents involving another 737 model. On hearing that another 737 Boeing was down in flames, made observers, researchers, and the general public conclude that it is typical of the Boeing 737 model. Even when the manufacturer insisted that the cause of the accident may not be an unintentional human error, his submissions rather annoyed the investigators and the general public the more not until it was proven much later that the aircraft in question was hit by the Iranian forces in retaliation for a United States airstrike that killed a top Iranian general and the leader of Iran-backed Iraqi militias. This later sweep in reasoning, rendered the earlier subjective conclusions premised on the previous observable cases inaccurate, misleading, and inconsistent. Important to observe in this puzzle is not about who said what and when, rather to test all the possible hypotheses in the causal chain leading to a scientific and conclusive remark. In the wake of this, the later conclusion (airstrike) may be proven inaccurate with the passage of time or less competent to explain the tragedy most especially when a more comprehensive examination is engaged. Multiple causes (equifinality) could have struck at the same time to cause this notable disaster

which observers may have failed to establish at the time of the incident due to the urgency and the sensitivity of the matter. To systematically tackle this case for academic benefit, one had to ask the following questions; Was it the only aircraft taking off from Tehran at the material time in question? Was the aircraft part of the error prone Boeing 737 family? Did it have any technical problems in the past or at the material time in question? Was the airstrike taking place at the same time with the taking off of the said plane? Were the two events happening in the same airspace? Circumstantially, this case can be proved beyond any reasonable grounds as humanly possible.

Understanding Counterfactuals

Social researchers have continued to provide hasty and simplistic conclusions in the name of offering answers to whatever happens in the social realm (Fred, 2019). These hasty yet simplistic conclusions have made companies and organizations shut down, lead countries into wars, bread interpersonal conflicts, and put professions into a disrepute. Counterfactuals are biased statements; “if the cause had not occurred, then the effect would not have happened” (Brennan, 2017). Our mental construction is wired in a way that whatever happens is attributed to a cause, this is okay but most oftenly, the causes singled out are always subjective and too unrealistic. In our daily lives, counterfactuals dominate human reasoning and because academia is also getting flooded with people of the same mental wiring, we have started to witness simplistic and illogical interpretations of events. A counterfactual reasoning might be “if school children are not well-fed, then their concentration levels in class are poor.” The bias in this statement is “ if the school children are not well fed, then… implying that, classroom concentration is a function of good feeding.” This proposition is inaccurate because it deprives other aspects the right to explain children's concentration in class. This counterfactual would be correct if children consistently perform poor whenever they are not given food. But in a situation where school children attend class with no good meal or without any at all, and perform excellent at the end of the day, faults this this reasoning/counterfactual.

No, only the phrase is simplistic (actually, it is not counterfactual because yes, the good and enough food is a demonstrated biological basis of the mental development; and – smiling emoticon - is philosophically demonstrated: did you hear about Udalaka Aruni?); but people, letting aside the researchers, never reduce things to one cause; so, the reasoning is … ‘’classroom concentration is a function of good feeding too.” Therefore, this aspect of counterfactuals must be revised, perhaps with another example; but generally, causality is never expressible by a reduction to one cause; the situation of one cause is always a simple case: the tea (in this cup of tea) is too sweet, because you put too much sugar inside. But when the ancient

primitive peoples looked to a bush whose leaves moved, they reviewed the more than one possible cause of the movement: the wind, an animal (big, small) etc. So, a little revision doesn't hurt, but let' see further)

In addition, the reasoning that if the current president of the United States of America (Donald Trump) didn't use the office to his advantage (The Ukrain Project) would survive impeachment trials, is indeed a subjective put rather an idealistic reasoning. The only way to qualify this reasoning is by comparing cases; how come other presidents with clear records of office abuse in the USA never got tried and/or impeached? What about in African countries where power abuse is the order of the day, how come their presidents never experience this! In the Arab World where the entire belt is engulfed by war, loosing lives of innocent people in hundreds of thousands partly due to the selfish interests of their presidents are never impeached and brought to books even when peace and rule of law are restored! Causal statements are so useful that most people cannot let an event go by without asking why it happened and offer their own "because" (Brady, 2011).

Necessary vs. Sufficient

The assertion that a statement is a "necessary and sufficient" condition of another means that the former statement is true if and only if the latter is true. Again, a given exposure is considered a necessary cause of an outcome if the outcome does not occur in its absence (Lawrence, 2014). That is, the two events/statements must be either simultaneously true or simultaneously false. Unlike the standard theory of conditions which assumes a converse relations that is; X is a sufficient condition for Y, only if Y is a necessary condition for X, in causal context the orthodox does not hold. The standard theory of conditions guarantees a counter condition that Y is responsible for X, a condition that is perceived illogical by many researchers (Matheus, 2019). For example, if Socrates being an Athenian is a sufficient condition for being Greaek, then being Greaek is a necessary condition for being an Anthenian (Silva, 2019). Whereas it may be possible, though in rare cases, to find Y a necessary condition for X, it is always important to avoid landing into inverse interpretations most especially when the skill to build a solid aurgument is suspect. Considering this example that; "my wife's systolic blood pressure goes above 200/mmHg whenever she does heavy exercises, the corresponding phrase seems illogical; if her systolic blood pressure goes above 200/mmHg, then she does heavy exercises" (McCawley, 1993). It is evident in this statement that, the causal condition presented in the first statement is violated by the corresponding statement. Proper interpretation would be that, Y (blood pressure) is a necessary condition of X (exercise), but X is a sufficient cause of Y.

Another example, being female is a necessary condition of being pregnant. Being female is not a sufficient condition, since you can be female without being pregnant. Again, having sexual intercourse, for example, would be called a necessary cause of being pregnant, but it's not sufficient, since you could get pregnant via artificial insemination and more still not all intercourse results in pregnancy (Brennan, 2017). It is also important to note that, A might be sufficient for B, but also other variables in the causal chain might be sufficient for B. For example, scoring A in research methods is a suffiecient condition for passing, so are getting a variety of other grades such as B, C and D. What do we learn from these statements? It is quite evident from the above cases that a sufficient cause presents a condition that will pretty much guarantee the effect. This kind of reasoning is used as a basis to conclude that the association or relationship between variables under investigation is causal. Again, it is a basis to remember that if X is not sufficient, it will not explain a change in Y. Many times researchers fail to identify competent X and mechanically force the association among variables and yet in actual sense X has nothing to do with Y, we fabricate these patterns when two variables appear to be so closely associated with each other (Archana, 2019). We shouldn't assume causation even if two events under examination seemingly happen together before our eyes.

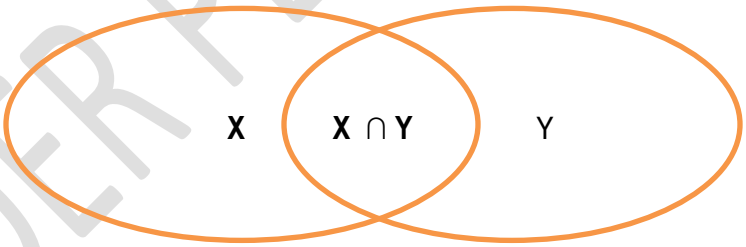

Figure 1: Necessary and Sufficient

The ven diagram above sheds light on the two concepts under discussion; being in the X∩Y region is sufficient to be in X, although not necessary. While being in X is necessary for being in X∩Y region, but not sufficient. Being in X and Y is both necessary and sufficient to be in X∩Y. in social research our interest should be placed on explanatory variables (Xs) that are both necessary and sufficient to predict changes in the dependent (Y).

Correlation vs. Causation

The saying goes; correlation does not imply causation (Aditi et al. 2019), this notwithstanding, there several scientific studies which make erroneous conclusions regarding a variable being a predictor of another, merely on the basis of observable correlation value. The human mind is wired to assume a causal correlation even when there is none (Bracy, 1998). This is evident in almost every statement people usually make on a daily basis regarding the occurrence of certain events and phenomena. They tend to justify why certain things are the way they are. Humans have attendance of assuming that whatever happens under the sun is caused by a chain of factors. Whereas this may sound ordinarily very okay, our interests as social researchers should go beyond such ordinary reasoning so as to offer logical conclusions based on scientific evaluations.

This notwithstanding, correlation and causation are often confused because our mental construction likes to find patterns even when they do not exist. In simple terms, correlations are measuring any kind of statistical relationship between variables whilst, causation measures the impact of X on Y. Because, in social research it is hard to establish causation dues to various forces within the social pattern, for some researchers, applying correlation for causation is just fitting (Bracy, 1998). This is a grave mistake because the conclusions that are finally drawn out of this are inaccurate and misleading (Daniel, 1999). In the statistical sense, for example, two or more variables are considered related, if their values change, that is, when the value of one variable changes (increase or decrease), so does the value of the other although may be in the opposite direction (Australian Bureau of Statistics, 2018). Important to note, however, is the fact that, not every observable change in one variable is automatically caused by a change in the other variable (Joseph, 2004). This is the centre of controversy in casual and correlational studies, researchers don't pay attention to the wave of patterns among variables, and only afford to offer simplistic conclusions for the sake of occupying scholarship space. Bracy (1998) shares with us a very interesting case, where the School Board established a positive correlation between students who took algebra in eighth or ninth grade and those who went to college. According to him, this finding was misinterpreted by the Secretary of Education who stated that passing algebra way the gateway to college and future employment. The Secretary's conclusion was causal in nature, although drawn from correlational spheres. Misinterpretations like this one can be a daunting undertaking; in this case for example, most lay readers would be deceived into believing that passing algebra predicts college entry and future employment. This Secretary's statement could result in an exaggerated response of students taking algebra under the assumption that their subject choice will eventually secure them vacancy in colleges and employment after college. (I think

again that this paragraph be improved by the author with a little commentary: people do not confound direct and ‘’the only” causes with a bulk of causes that constitutes the correlational area. Both the Board and the students understood very well that hard working and the early habits of discipline in learning, and this involves also the habit and discipline of algebra, are essential for the future path of the student: the entrance in college and, generally, a better competency in the future work. In this respect, algebra is/was too the symbol of hard working etc. Did the Secretary not take, too, the problem of algebra in the above sense?)

Important to remember is the fact that, correlations can sometimes though in rare cases be used to determine causation, but this requires technical competence which most social researchers lack (Bracy, 1998). To avoid landing into a state of confusion, it's better to treat them independently rather than using one to determine the other. We often make so many correlations in research, but establishing causation requires a unique experiments and critical examination of patterns within the causal chain. To appreciate how the two relate with or differ from each other, let us use the following illustrations; Correlation and causation both deal with variables, that is independent and dependent. An independent variable is a condition or piece of data in an experiment that can be controlled or changed (Catherine, 2010). It is the presumed cause of variation in the dependent variable, a predictor or explanatory variable (Amin, 2005, & Fred, 2019). The dependent variable also known as the criterion is the predicted variable (Creswell, 2003). It is a piece of data in an experiment that is influenced by the external factors (Catherine, 2010).

There is a statistical correlation in certain months of the year between juice consumption and the number of road accidents. Does it mean that juice sellers are responsible for road accidents? This is practically impossible regardless of the existing statistical correlation. The correlation occurs because of the increased temperatures of summer, which cause both high juice intake and poor concentration of road users hence causing accidents. High temperatures can be reinforced by another couple of extraneous variables such as quality of the road, traffic laws, and among other factors to cause fatal accidents. Our role is to keenly analyze the causal chain as it unfolds. From this example, one can clearly observe that there is a positive correlation between juice consumption and the frequency of road accidents. These two cases are just correlated, but not cause and effect. A negative correlation will demand an opposing influence among the two variables. For example, juice consumption will reduce alongside an increased rate of road accidents and vice versa.

Causation, also known as cause and effect, is when an observed event or action appears to have caused a second event or action (Catherine, 2010). For example, it is common sense that juice consumption doesn't cause road accidents. However, high temperatures can adequately explain this scenario, likewise an increase in road accidents can be attributed to a chain of factors, temperature inclusive other than juice intake. Causation is more critical than correlation and the world is run by the cause and effect principle, yet very many researchers seem less capable to articulate causation (Blobaum, 2019).

Determining Causal Space

To establish whether two variables are causally related, that is, whether a unit change in the independent variable X results in a change in the dependent variable Y, you must establish: (1) Temporal Sequence: This sequence demands that the cause must have occurred before the effect. For example, it would not be appropriate to credit the increase in staff performance to salary increment if the increase in performance had started before the increment. (2) Co-variation (statistical association): This suggests that, any unit change in X (independent variable) must be accompanied by changes in the value of Y (dependent variable). A unit increase/decrease in salary must be accompanied by an appropriate response from employees of any sort. (3) Rationale: There must be a logical and compelling explanation for why these two variables are related. For the case of salary increment and employee performance, it is widely known that the largest population settle for jobs whose salary is reasonable to address employees' social and economic demands of the day and the future. (4) Non-spuriousness: Without any rival explanations from the covariates, it must be established that the independent variable X, and only X, is the cause of changes in the dependent variable Y. A change in employee performance in this case, must be adequately explained by salary increment.

Conceptualizing a Casual Space

A conceptual framework or model is a diagrammatic expression of the assumed relationship or causation between variables under study. Whereas it may be easy to determine the directionality of the relationship in a conceptual model, it may be hard for causation. Most misinterpretation of correlation for causation occurs fairly frequently when the variables in the causal space are not well taken care of. Considering the following diagram, it is clear that, apart from the assumed direct correlation between X and Y, there exists a set of extraneous variables marked (Z). Unless these variables are promptly considered, the results and interpretations of the study may be questionable. Whereas it is obvious in the diagram that X directly

relates to Y, for causation the story is likely to be different. It is more likely to establish that Y is as a result of Z_1 and Z_2 after being influenced by X, or an interaction between Z_1,Z_2 and Z_3 explains a change in Y. A chain between Z_1, Z_2 and Z_4 may as well be responsible for Y. Finally, an interaction between Z_1, Z_2, Z_3 and Z_4 may cause Y, which subsequently causes X. This is a more complex model with direct and indirect causal links.

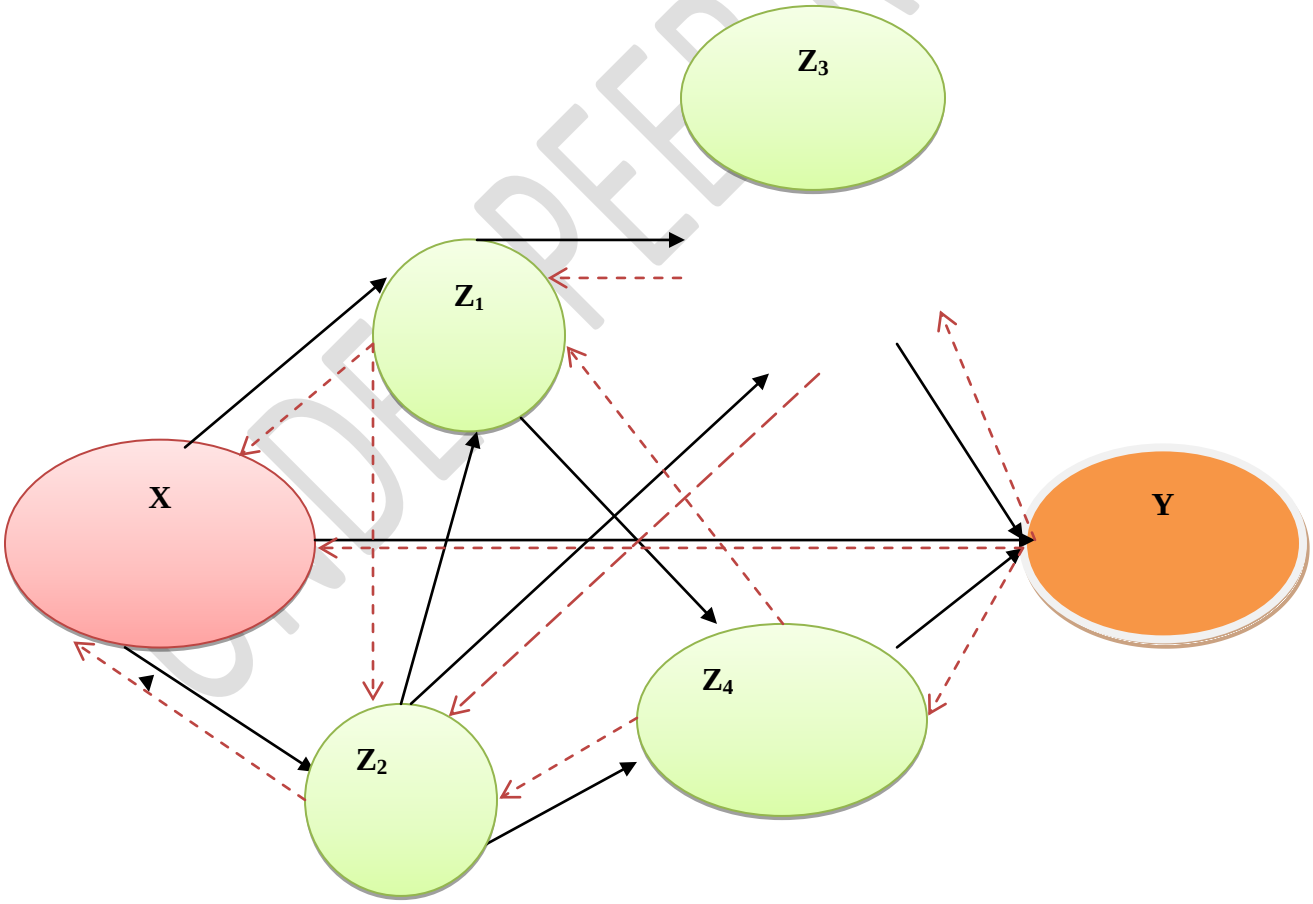

Figure 2: Conceptual Framework for Direct and Indirect Causal Links

Source: (*Fred. Ssemugenyi. A. A. Augustine & Kazibwe Sophia, 2020)*

Conclusion

Whereas it is undoubtedly difficult in social research to establish causal relationships Devroop (2000), discouraging social researchers from carrying out causal experiments for fear of committing statistical errors, is a misguiding transcription. Social researchers should be reminded, that correlational philosophy of building an explanation that is based on associational evidence is good, but reinforcing it with the cause and effect statistical inference for the sake of having a holistic understanding of social patterns is the best option.

The lesson this paper draws is that, a lot of vital information is left unattended to when social researchers deliberately ignore the cause and effect philosophy. You will agree, that the majority prefer a correlational approach because of its simplicity as observed by Daniel et al, (1999), & Cox et al, (2004), but establishing that two or more variables are correlated doesn't mean so much in the world of reasoning (Wiegmann, 2000). Regrettably, social researchers who mimic the cause and effect philosophy, through correlations, have continued to fabricate the cause and effect patterns when two or more variables appear to be closely associated (Fred, 2019). It should be remembered that, we cannot simply assume causation even if we see two events happening, seemingly together, before our eyes. The reason is simple, our personal observations that are premised on feelings are usually anecdotal (Strater, 1996). A rigorous analysis is needed to avoid falling into a trap, if this is done, social researchers will come up with very interesting cases which interpret social patterns in their real sense. Wont it be interesting to find that X is actually caused by Y (opposite force), X and Y are correlated but they are actually caused by Z, X causes Y as long as Z happens, and finally a chain reaction where X causes Z, which leads Z to cause Y. When using our observations as a tool for analysis, these patterns can't be noticed, we simply assume that X is associated with Y (simple linearity), which association is sometimes nonexistent and if anything, is not so much relevant before the eyes of the puzzle under investigation.

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