The Proposition: An insight into research

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Abstract

Propositions form the basis for scientific research. The validity of a research study is, to a large extent, evaluated on the criteria of its propositions. For internal validity, study propositions provide information regarding precision of definitions, measurements, associations, confounding factors etc. that are considered in research. While for external validity, propositions form the premise for the deduction of inferences. The aim of this article is to help readers understand the propositions that are made in research. This article discusses those propositions, which are relevant to medical research (JPMA 51:49; 2001).

Go vernm en! Warning: (a) Surge on General'sWarning: Women should not drink alcoholic beverages during pregnancy becausc' of the risk of birth defects.
(b) Consumption qf alcoholic beverages impairs your ability to drive a car or operate machinery. and may cause health problems[1].
A proposition is a declarative statement of a concept. Basically, a proposition is a narration of a concept, which requires the same level of caution and precision that is expected of scientific research. The identification of a proposition requires a careful review of the excerpt. It is always useful to identify propositions before labelling or categorising them. This will broaden the vision for identification without the narrowness of the pigeonhole attitude.
After identification, categories can be assigned to the propositions on the basis of perceived shared particulars, so that the propositions can be compared in a standardised manner. They can be broadly categorised into non-relational and relational propositions. This classification apart from being practical also shows the propositions constructibility on the gradual accumulation of the knowledge produced in research.
As discussed in the previous articles, a concept is a title given to an abstract idea, event or object. These are based on real world experiences and represent a generalised mental picture of characteristics of that phenomenon[2].
Moral: All words are pegs to hang ideas on Ward Baeches-Henry
The non-relational proposition is a declarative statement, which serves the purpose of identification of concepts and defining the distinct characteristics of the concept to the required level. The concept can have various facets and a declarative statement can be about any aspect of the concept.
The Existential Relational Proposition recognises the presence of a concept
- The poor also live in this community.
Or it can go one step further by recognising the level or intensity of presence of a concept.
- At least 30% of the people living in this community are poor
Now the concern is what is poverty and what are its characteristics.
The Definitional proposition is a statement, which describes the characteristics of the concept. A concept can have a multitude of aspects. It is not necessary in research that a concept should be considered in a holistic manner.
- Economic poverty: poverty in ternis of money or economics e.g. lrni' level of income.
- Non economic poverty: e.g. poor in terms of food, rights etc3.

Defining a concept aims to state it in a precise nature and give it distinct characteristics. The focus of this effort is to limit the idea of the concept so that it becomes identifiable and calculable. Sometimes it even describes the degree of distinctness so that it can be better differentiated from other concepts. Any concept when we grade it for measurement purposes is conventionally known as a variable in research terminology.

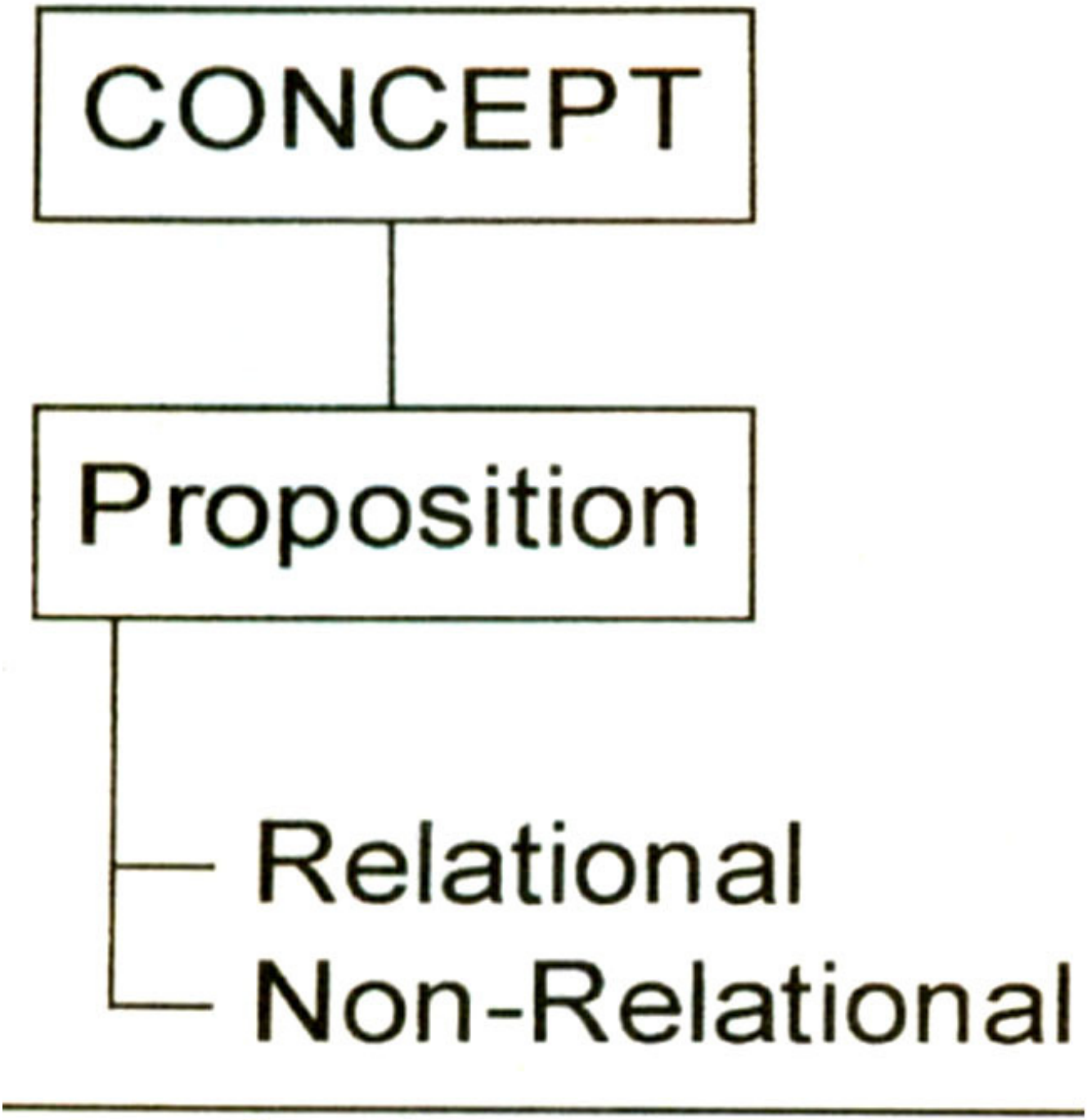

Figure 1 Classification of Propositions

Definition propositions are not limited to the concepts that are evaluated in the research. They are even extended to the methodology aspect of the research. Well known general methodology concepts, unless some innovation is considered, explicit definitions are usually not given e.g. study designs. But

concepts which are specific to the study; are defined explicitly and precisely e.g. study population. Initially for the theory, definitions of concepts are delineated by a parameter of convention not of verification. It is later in the process of theory development, that steps are taken to measure and study the concepts empirically. The process takes place at two levels.

Nominal definitions are constitutive statements, which are an aspect or aspects of the concept that we are considering for research. For example Poverty has many faces.

- Povert is a state of being deficient in money
- Poverty is a state of living one-day at a lime
- Poverty is a slate of lack of shelter food or clothing
- Poverty is a state of powerle.csness and lack offreedoni.
- Poverty is a slate of defIcient means as compared to the haves.

Operatioizal definitions are real statements of measurement-orientated interpretation of concepts. These definitions deal with the practical aspects of research in relation to concepts. They can be further categorised into measured and experimental.

Experimental Operational Definitions' describe

how a nominal concept is manipulated, to make it measurable in the research process, in a manner devised by the researcher.

- Those fain ilies whose children cannot attend school due to financial reasons would be considered to be in a state of poverty in the community

Measured operational Definitions state how a nominal proposition can be measured in a standardised conventional manner. The Poverty could be assessed by:

- Gross Domestic Product (GDP) is the total output of goodc and services for fInal use products produced by a country / economy[4].

Sometimes it becomes more meaningful to combine various measurements, as relying on only one type of measurement could not effectively capture the required scope of the concept. Therefore an index is formed. The indices are usually a combination of the measurement, e. g. The GDP has less meaning in itself in terms of development unless it is combined with other indicators such as education, health or longevity.

- Human Development index (HDI) is a composite considering longevity educational attainment and standard of living of a population[5].

Empirical Indicators are the next logical step of operational definitions. To increase the utility of the indices, indicators are constructed upon them. A cut off value is decided conventionally among the range of values of an index. The ones that have achieved above that cut off value constitute one category and those below are also labelled as another category.

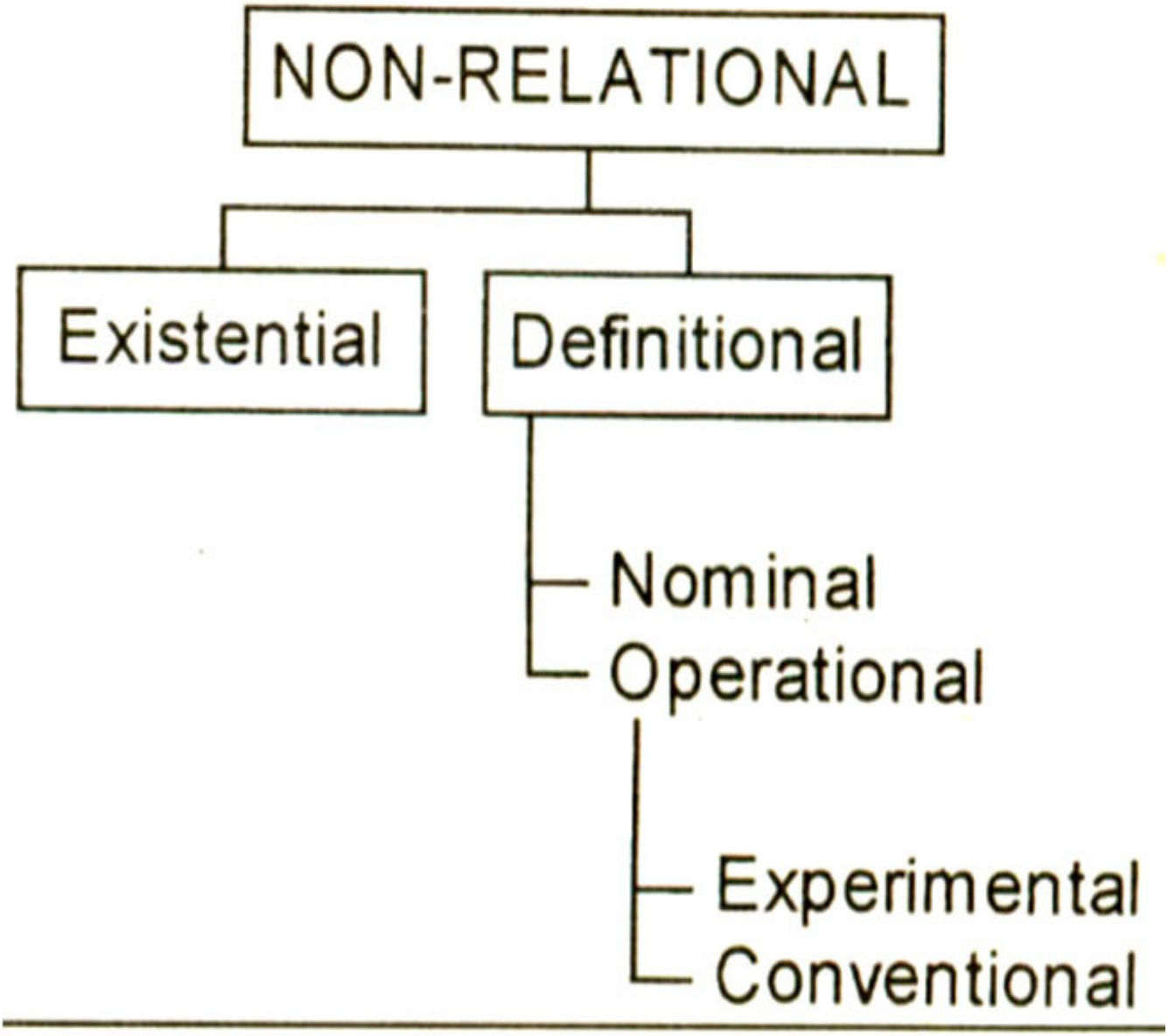

Figure 2 Classification of Non- Relational Propositions

-The Poverty Line determines thai (1 perSon is in a slate of' poverty (~his consumption or income level fOIls below the minimum level necessary to meet basic needs. For poverty, UN considers the cut off set at 1$ or 2$ / day in 1993, according to purchasing power parity ferms[6].

- For Anthropometric indicators: Weight for age. height fOr age and weight for height, taken 2 standard deviation below the values of ref ference population are considered as a state of underweight, stunted and wasted respectively[7].

Indicators can either be used to describe or identify two categories of haves and have nots, or the idea may be extended to more than 2 categories to get a finer grading of the concept.

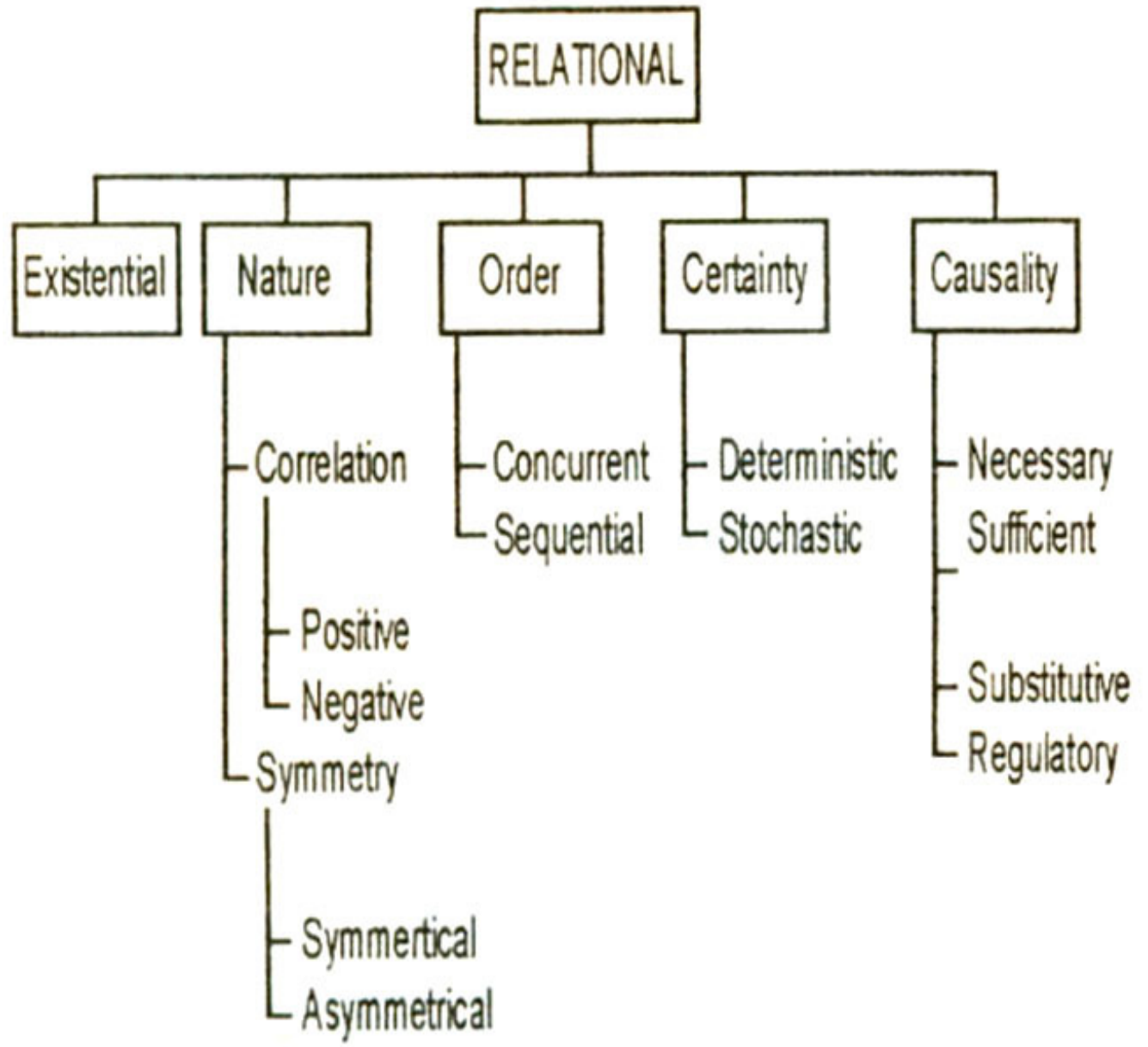

Figure 3. Classification of Relational Propositions

- Countries having HDI of 1.00 - 0.80 have High Human

Development, those having 0. 50- 0.79 and below 0.50 have M ledium and Low Human Development[5].

The Relational Proposition is a declarative statement that serves the purpose for identification of association between concepts and defining distinctive characteristics to a required level.

The Existential Relational Proposition is a declaration that the association between the two concepts is a repetitious association and is not a solitary, onetime phenomenon.

- Theic is a relationship between the finn//v income and the child's nutritional status[8].

Nature of Relational Proposition

The Correlation Proposition states the covariation between related concepts. The direction and degree of change are specific for each association.

The Positiv ely correlated Proposition states that if one-concept changes, the other concept would also change in the same direction.

- The relationship between family income and child's nutritional status is positive/v correlated[8]. As the mother's years of schooling increase, the child's nutritional status improves.

The Negatively correlated Proposition states that if one-concept changes, the other concept also changes inversely or indirectly.

- The relationship between coffee consumption and bronchial asthma is inversely correlated[9].

The Sym metrical Relational Proposition

(ambivalent) states that two concepts have a reversible relationship. i. c. if a change occurs in one concept, then the other concept will also change, and vice versa.

- The relationship between coffee Consumption and bronchial asthma is symmetrical. The caffeine intake has a bronchodilator effect in asthma, while an alternate explanation could be that as a result of svinpathomimetic effect of drugs, asthmatic patients reduce their coffee intake[9].

The Non-Symmetrical Relational Proposition states that two concepts have a non-reversible relationship i.e., if change occur in one concept then other concept will change also but not vice versa. Maternal education is negatively correlated with under-5 child mortality[10]. But the mortality of children under 5 has no relationship with maternal tears of schooling.

Order of Relational Proposition states that either the concepts exist simultaneously or they are following one another. Propositions are usually assessed over a period of time.

The Concurrent Relational Proposition recognises the existence of 2 concepts together but is not sure of their time order and both concepts are observable simultaneously. Usually such propositions are found in case series, cross sectional studies etc.

- Allergies and asthma have a strong concurrent re/at ionship[11].

The Sequential Relational Proposition goes one step further in identifying. the following concept. In other words in a relation, the preceding and proceeding concepts are identified. Usually such propositions are found in longitudinal studies.

- Gestalional diabetes begins during pregnancy[12].

The Magnitude of effect proposition states what proportion people, exposed to a preceding concept, develop a sequential or proceeding concept or vice versa. There are specific measures for the magnitude of effect according to the study methodology applied for data collection.

- Oral elefi I patients are 1.29 limes as likely to have been exposed to maternal cigarette smoking in first trimester as compared to controls into the stochastic category. Such kind of certainty is mainly offered by the physical and mathematical sciences.

- Sound frequency beyond 2000 Hz: is not audible to the human ear[15].

The Stochastic Relational Proposition states that there is an element of probability or chance in the occurrence of a specified relationship between the concepts.

- A single dose of 600-800 cGy may cause permanent infertility in males[16].

This requires further careful consideration, as a majority of propositions in medical research are probability based and always keep room for deviational phenomenon. As advances are being made in scientific research, factors that cause uncertainty are being identified, and this has resulted in development of modified deterministic proposition[17]. However these advancements could also give rise to the element of uncertainty regarding deterministic propositions[18], and trigger a stimulus for newer stochastic propositions.

The Causality of Relational Proposition introduces the idea of a relationship between input and outcome concepts. Causality can be viewed in a number of ways in the relational propositions, i.e. necessary, sufficient, substitutive and contingency.

The Necessary Relational Proposition states that if and only if an input concept is present then the outcome concept will occur, or it is not possible for outcome concept to occur without the first occurrence of specific input concept.

The Human Immune Deficiency Virus (1111-1,1 causes (AIDS) acquired immune deJlcienci' syndrome[19]. The disease Acquired fin mune Deficiency Syndrome (AIDS) will develop on/v among those group of people who are exposed to the Hil It is possible that those who are exposed may not develop AIDS, but it is not possible that those who are never exposed to the virus will develop the disease.

The Sufficient Relational Proposition of causality states that an input concept alone is enough to cause outcome concept to occur.

The defIciency of phenylalanine kvdroxvlase in a new-born leads to phenylketoneurea[20]. Here, in the normal course of action, the deficiency of the enzyme is sufficient to cause the illness and always results in metabolic disorder having severe mental retardation in children.

The Substitutive Relational Proposition of causality states that from a certain group of specified input concepts, if any one is present the outcome concept will occur.

- Poverty frequent injections, unprotected water source, any one of these can result in malnutrition in children[21].

The Regulatory Relational Proposition of causality states that the relationship between the input and outcome concept is contingent upon or influenced by the presence of a third concept.

In causal propositions, the intervening concept could be an intermediary step of input concept producing an outcome.

Vitamin A deficiency produces keratomalacia[22]. But actual/v Vitamin A deficiency results in Corneal Xeroxes which in turn produces keratomalacia,

In such cases, the state of contingency is being decided by what we have decided as our limit or outcome in a process. Furthermore, different contingency concepts are identified as research methods become more advanced, or instruments become more sophisticated. Another variant of regulatory proposition is when the intervening concept is not an actual part of the relationship between concepts but acts as an extraneous factor which could influence the magnitude of effect of association between the relational concepts. This extraneous factor is also known as confounding.

- There is a positive correlation between family income and the child's nutritional status[8]. However, such association is contingent on the gender of the child. The magnitude of effrct is like/v to be nwrefkr the in ale child as compared to the female child

Moral: The proposition justifies a concept in terms of its existence, explanation and relationship with other concepts.

One of the main objectives of scientific literature review is to identify the propositions presented in the reports. Unfortunately, they are not obvious mostly. Instead of formally stating, the writer of a scientific report assumes that the readers background knowledge and intellect is enough to allow him comprehend the implicit notions of propositions. Sometimes it requires several readings by the reviewer before all potential propositions are identified. A clear and simple categorical statement of non-relational and relational propositions in a scientific report not only enhances the quality of a paper by providing better comprehension, but also minimises the ambiguities and misinterpretations.

Another advantage of a better understanding of the dynamics of propositions is that. right from the beginning, a researcher becomes more focussed and develops a niche for the theoretical precision that he wants, and how to measure that. This helps in specifying the methods of measurement, but also formulating the study goals, objectives, hypotheses and research questions.

At the end of the research process there is always the urge and the temptation to extrapolate the results, which could be beyond the scope of the study objectives and methodology. At that point in the research, the propositions are considered as the starting point. They will form the premise, within which the inference or conclusion of the research can be deduced.

Moral: Propositions form the framework of knowledge.

References

1.Alcohol Beverage Labelling Act of 1988 HR 5409, Pub L No. 100-690
2.Avan BI Point of entry into Research Problem orientation. J. Pak.Med.Assoc., 2000 50 279-282.
3.Review of Poverty Concepts and Indicators. Poverty Elimination programme, UNDP, 1998.
4.Satnulson PA, Nordhaus WD. Economics. 16th ed, Irwin, MeGram-Hill, 1998.
5.Human Development Report 2000. UNDP, NewYork, Oxford University Press 2000.
6.Entering the 21St Century. World Development Report 1999/2000. New York, Oxford University Press, 2000.
7.Physical status The use and interpretation of anthropometrv. Geneva,WHO, Technical report series no 854,1995.
8.Li Y, Guc G, Shi A, et al. Prevalence and correlates of malnutrition among rural minority areas of China. Pediatr. lnt., 1999, 41:549-56.
9.Pagano R. Negri E. Decarli A, et al. Coffee drinking and prevalence of bronchial asthma. Chest, 1988. 94: 386-9.
10.Agha S. The determinants of infant mortality in Pakistan Soc. Sei, Med., 2000. 51: 199-208.
11.Chew FT, Teo J, QuakSH. et + Factors associated with the increased respiratory symptoms among asthmatic children in Singapore. Asian. Pac. J, Alkrgv. Immunol., 1999:1 43-53.
12.http I 56.40.88.3/publications/pubs/gest I .html
13.Wysznski DF, Duffy DL, l3eatv TH. Maternal cigarette smoking and oral clefts: a uneta analysis. Cleft Palate Craniofac J., 1997: 34. 206-10.
14.Gupta users in Muimbai.lndia. BuIl.WH 0., 2000:78:877-81.
15.William F. Review of Medical Physiology. 1 7th edition, NewYork Prentice Hall International. Chapter 9, 1995.
16.Current Medical Diagnosis aiid Treatment 38th edition, Appleton and Lange, Stanford. Connecticut, Appleton and Lange, 1999.
17.Kenneth JR. Modern Epidemiology. 1st ed Boston, Little, Brown and Co. 1986, pp.15-16.
18.Hodgkin P. Medicine. postmodemisrn, and the end of certainty. Br. Med. J 1996: 313:1568-1569.
19.Current Medical Diagnosis arid Treatment 1999.38th edition, Stanford, Connecticut, Appleton arid Lange. 1999.
20.Behrman RE. Kliegman RM, Jenson NB Nelson's textbook of Pediatrics. 16th ed, W. B. Saunders Company Philadelphia. 1998.
21.Current Medical Diagnosis and Treatment 1999. 38th edition, Stanford, Connecticut. Appleton arid Lange, 1999.
22.Cottron RS, Kumar V, Collins T. Robbins Pathologic Basis oh' Diseases, 6th ed, Philadelphia, W. B. Saunders Company, 1999.