

Does Attitude Associate, Correlate, Or Cause Behaviour? An Assessment Of Attitude Towards Health Behaviour Under One Health Approach In Morogoro, Tanzania

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Abstract: Literature doesn't empirically posit it very clear whether attitude associates to, correlates or cause certain health behaviours. Yet; little that is known is limited to associating attitudes with health behaviour in the context which did not take into account the interaction of humans, animals and the environment. A cross sectional study was conducted in Morogoro urban and Mvomero districts in Tanzania , aiming at:- (i) assessing attitudes over health behaviour under the interface of humans, animals and the environment; and, (ii) analyzing associations, correlations and causality existing between attitudes on health behaviour and health impairing habits/practices under One Health Approach. The sample comprised of 240 respondents obtained through a multistage sampling procedure. Data was collected through a structured questionnaire using a Computer Assisted Personal Interviewing (CAPI) electronic platform. Associations between attitude and health behavior were modest at $p \text{ value} \leq 0.001$, correlation coefficient was significant with $r = .235$ and $p \text{-value} = < 0.01$, and no evidence of having attitudes directly causing certain behaviours was established. In logit regression analysis, health literacy was found to predict health behaviours too. Individual behaviors performed in a particular context tend to be influenced not only by general attitudes but by a wide range of additional factors.

Keywords: Attitude, Computer Assisted Personal Interviewing, correlation, Health Behaviour, One Health Approach, , Tanzania.

1. Introduction

1.1 Background Information and Problem Statement

It is apparent that health behaviours can be influenced by numerous biological, psychological, and social factors (e.g., [1],[2],[3],[4],[5]). Attitude towards health related behavior being among such factors. Despite the fact that attitude is reported to have relationship with health behavior existing literature doesn't empirically posit it very clear whether attitude associates to, correlates or cause certain health behaviours or vice versa. Very little is known about the precise relations between attitude and the health behaviours e.g., [6]. Yet; little that is known is limited to associating attitudes with health behaviour in the context which did not take into account the interaction of humans, animals and the environment. It is obvious that for optimal health of humans, animals and the environment to be attained One Health Approach has to be taken into account. Some literature reported poor correlations between attitude and behavior e.g., [7][8][9], some ([10];[1] suggested that relations between attitudes and behavior would be stronger if attitudes and behaviours will be measured with the same level of specificity, others e.g., [11] posit that attitudes have predictive priority over behavior, there is a claim that behavior causes attitude [12], while [13] asserts that attitudes and behavior influence each other reciprocally and others declare that the influence of attitude on behavior depends strongly on moderator variables, such as individual

differences, in the accessibility of attitudes or beliefs from memory [14],[15] or in personality characteristics e.g., [16]. Other studies confirmed that specific, relevant attitudes do predict behaviour ([17], [18],[19],[20],[21],[22],[23],[24]. There is a claim that a general attitude is likely to predict a behavioural domain and not a specific behavior [25]. It is not then very clear whether attitude and health behavior are associated, correlated, or causing each other. Much as literature does not document empirically the relationship that exists between attitudes and health behaviour. It is very clear that correlation implies association, but not causation. Conversely, causation implies association, but not correlation [25]. This paper contributes to the ongoing discussion on whether there is causation, correlation or association that exists between attitudes and health behaviour using a data set from a study conducted in Morogoro and Mvomero districts in Tanzania. Due to increased interactions between humans, animals and the environment the world is definitely registering a number of observations on how such interactions are affecting health of each other for this reason then need for assessment of attitudes and its relationship with health behavior in the context of the interface of humans, animals and the environment.

2. Theoretical Approaches to the study

2.1 Definitions of Key concepts

2.1.1 Attitudes

Attitude refers to beliefs and feelings related to a person or event and the resulting behaviour. Taken together, favourable or unfavourable evaluative reactions— whether exhibited in beliefs, feelings, or inclinations to act—define a person's attitude toward something [26]. It is definitely that in the course of responding quickly to something, how we feel about it can guide how we react [27],[28], [29]. In assessing attitudes three dimensions can be looked into: affect (feelings), behaviour (intention), and cognition (thoughts).

2.1.2 Health Behaviours

Health behavior signifies any act that may affect an individual's physical health or any habit that an individual believes may affect their physical health. In this article health behaviors are defined as any activities undertaken for the purpose of preventing or detecting disease or for improving health and well being. Health behaviours are classified as health enhancing and health impairing [30],[4]

2.1.3 One Health Approach

One Health approach recognizes that numerous disciplines across many sectors are required to solve the complex problems facing public health. It takes a holistic approach to address issues towards attaining optimal health for human, animal, and ecosystem. It emphasizes multi-sector, transdisciplinary action across health related professions (i.e medical doctors, veterinarians) and other related disciplines (i.e environmentalists) to ensure well-being within human, animal, and ecosystem interfaces [31],[32],[33]. One of the major issue in control of infections transmissible to man and animals is the lack of or limited joint approach to improve the situation.

2.2 Theoretical Framework

There are a number of theories and approaches that address issues on attitudes and health behaviours; this paper benefited from the following theories and approaches.

2.2.1 Theory of Planned Behaviour (TPB)

The theory of planned behaviour underline the fact that behavioural intentions are the outcome of a combination of several beliefs .The theory hypothesizes that a certain behaviour is determined by the strength of the person's intention to perform that behaviour and the amount of actual control that the person has over performing the behaviour [34]; [35],[36]. According to [37], intention is 'the cognitive representation of a person's readiness to perform a given behavior, and ... is considered to be the immediate antecedent of behavior', and actual behavioural control 'refers to the extent to which a person has the skills, resources and other prerequisites needed to perform a given behavior'. The theory proposes that intentions should be conceptualized as 'plans of action in pursuit of behavioural goals' [36], and that the strength of a person's intention is determined by three factors (composite beliefs):

a) Attitude towards a behaviour

– It is composed of a positive or negative evaluation of a particular behaviour, and beliefs about the outcome of the behaviour. This signifies their overall evaluation of performing the behaviour.

b) Subjective norm

– This represents the beliefs of important others about the behaviour, and the individual's motivation to comply with such beliefs. These are people who are important to an individual about to perform a certain behaviour will they approve if one does something; simply this individual needs their approval. It had to do with the extent to which they think that important others would want them to perform it.

c) Perceived behavioural control

– It comprises of a belief that an individual can carry out a particular behaviour based on a consideration of internal control factors (e.g. skills, abilities, information) and external control factors (e.g. obstacles, opportunities) – both of which are related to past behaviour.

Why TPB?

(a) TPB has one composite belief which addresses issues on attitude towards a behaviour, (b) it is a general theory; (c) the constructs are clearly defined and the causal relationships between the constructs clearly specified; (d) the theory has been widely used to study health behaviours [38] and other types of behaviours. From the theory this paper is informed that a positive or negative evaluation of a particular behaviour and beliefs about the outcome of the behaviour is what directs behaviours and behavioural intentions are the outcome of a combination of several beliefs. This theory therefore tells us attitude is linked to behaviour. It is against this assumption that this paper assessed the association, correlation and causality that exists between Attitudes and Health Behaviour under One Health Approach. As it is further suggested [39], [40] that one of the reasons individuals continue to practice unhealthy behaviours is their inaccurate perceptions of risk and susceptibility.

2.2.2 Principle of Aggregation (PoA)

It is argued [24] that a general attitude will predict a behavioural domain, but not a specific behaviour. A behavioural domain is a set of related behaviours. This approach calls for identification of behaviours which could be taken as behavioural domain and the approach insists on having specific behaviours be distinguished from behavioural domain. It hypothesizes that many null findings in behavioral development (found to be unrelated due to repeated failures to obtain substantial correlations) simply on failures to aggregate. The principle of aggregation states that the sum of a set of multiple measurements is a more stable and representative estimator than any single measurement. This greater representation occurs because there is inevitably some error associated with measurement. By combining numerous exemplars, such errors of measurement are averaged out, leaving a clearer view of underlying relationships.

Why PoA?

This approach has been found to be useful in various major areas of developmental research including:- (i) attitude–behavior relationship, (ii) personality–behavior relationship, and; (iii) role-taking/altruism relationship [72]. PoA insists on identification of a set of behaviors broadly representative of the same behavioral domain. This increases the reliability of the behavioral measure and also ensure that the behavioral criterion has construct validity.

2.2.3 The Principle of Compatibility (PoC)

The principle of compatibility [35],[41] requires that measures of attitude and behavior involve exactly the same action, target, context, and time elements, whether defined at a very specific or at a more general level. According to [42], the principle of compatibility [35], [24] offers insight into when attitudes should be most strongly associated with behavior. This tenet states that measuring the attitude and the behavior at the same level of specificity can maximize the predictive power of attitudes.

Why PoC?

This principle is most useful in the sense that it reminds on the need to measures o attitude and behavior exactly based on the same action, target, context, and time elements.

3. Materials and Methods

This study was conducted in Morogoro municipality and Mvomero districts both found in Morogoro region in Tanzania. Morogoro municipality and Mvomero districts have a population of 315,866 and 312,109 people respectively distributed in 19 and 17 administrative units namely as wards according to 2012 Population Census [43]. Morogoro urban and Mvomero districts in Morogoro region in Tanzania were chosen for this study due to the fact that these areas are providing good incidences of interfaces of humans and animals plus very diverse socio-cultural and economical backgrounds of the inhabitants in the area. It is a home to a pastoral community of Maasai origin; the area is as well bordered by Mikumi National Park, hence at a higher risk due to possibility of prevalence of certain health behaviours and a higher level of interaction between human and animals. Previous study [44] has also identified health risks presence in the area. A cross-sectional design was employed whereby both qualitative and quantitative data were collected at a single point in time. The design was chosen because of being economical in terms of time, financial resources and nature of the study objectives [45]. The study had three (3) sampling units, namely: - the household; focus group discussants and key informants. Multi stage sampling procedure was used, which included four (4) stages that were for the choice of districts, wards, villages/streets, and HHs. Purposive sampling was employed to identify wards and villages based on the criteria of presence of animal keeping and related activities plus evidence of selling livestock products to Morogoro Urban (for Mvomero district) and livestock products markets from Mvomero (for Morogoro district). Simple random sampling was applied to select respondents. The sampling frame (list of households in each study area) was drawn using local leaders. Two hundred and forty (240) HHs were selected from four (4) purposively selected wards, two (2) wards from each

district, two (2) villages/streets from four (4) wards and 30 respondents from each village/street, hence a sample of 240 respondents .The sample size on each village/street is justified by [46] who argues that a sub sample of 30 respondents is regarded as the bare minimum for studies in which statistical data analysis is to be done regardless of the population size. A structured questionnaire guide administered through a Computer Assisted Personal Interviewing (CAPI) electronic platform was used to collect primary data from HHs. Secondary data involved literature review from various official documents. Descriptive and inferential statistics were used to analyse quantitative data, whereby frequencies, chi-square, mean, maximum scores and coefficients correlation were computed. Quantitative data were analyzed using IBM-SPSS version 20 and Gretl software. All statistical tests were considered significant at p-value = <0.05. An index was developed to measure Health behavior while Likert scale assessed Attitudes of respondents on health impairing behavior/practices.

4. Identifying, Defining and Measuring of Attitudes and Health Behaviours

In any study on the determinants of health behaviour, it is important to define the behaviour of interest as clearly as possible [1],[47]. According to [1], behaviours can be defined in terms of four components: action, target, time and context. The action component is an obligatory element of the definition of any behaviour. The target component is usually necessary, depending on circumstances. Time and context are optional; only for specificity on a particular definition of behaviour. In this study, individuals were asked “In the past three (3) months have you ever i.e consumed raw meat?”. Here, ‘consume ’ is the action, ‘raw meat ’ is the target and ‘in the past three months’ is the time component. No context was specified in this study. Literature[48],[49],[50],[51],[52],[53],[54],[55],[56],[57],[58],[59],[60],[61],[62],[63],[64],[65],[66],[67],[68],[69],[70],[71],[72],[73],[74],[75],[76],[77],[78],[79],[80],[81],[82],[83],[84],[85],[86],[87],[88],[89],[90],[91],[92],[93],[94],[95],[96],[97],[98],[99],[100] were reviewed to identify Health Behaviors and practices under the interface of humans, animals and the environment. For purpose of this study these behaviors were summarized and categorized into health enhancing and health impairing behaviours. Identified behaviours were measured as dichotomies: With a “Yes/No response.” This implies that the person had a choice between two mutually exclusive and exhaustive alternatives: performing the behaviour or not performing it. This approach has been supported by [71]. An index of score was constructed to measure behaviours were all “No and Yes” responses were given values of 1 and 2 respectively. A total of 38 Health impairing practices/habits were presented and respondents were supposed to indicate if they had involved themselves or not in such practices by saying “Yes or No”. Given the fact that the presented practices/ behaviours were health impairing, hence the higher the score the lower engagement in health enhancing behaviours and vice versa. Attitudes of individuals towards HIB was gauged using the same 38 Health impairing practices/habits (identified through literature review). The same health impairing practices/habits were subjected to attitudinal tests as Principle of Aggregation insists on identification of a set of behaviors broadly representative of the same behavioral domain. A behavioural domain is a set of related

behaviours [24],[72]. A Likert scale was used to measure attitudes of respondents towards health impairing behaviours in which thirty eighty (38) statements were administered, whereby half of the statements had negative connotation while the other half had positive connotation. For each statement, the respondents were asked to indicate whether they strongly disagree, disagree, undecided, agree, or strongly agree with the statement. For all positive statements the response “Strongly Agree” was given a weight of 5, while “Agree” was given weight of 4, “Undecided” was given weight of 3 and “Strongly Disagree” was given weight of 2 and “Disagree” was given weight of 1. For all the negative statements the response “Strongly Agree” was given a weight of 1, while “Agree” was given weight of 2, “Undecided” was given weight of 3 and “Strongly Disagree” was given weight of 4 and “Disagree” was given weight of 5. Based on the statements provided, an index for each respondent was constructed as measure of their attitude towards health behaviour.

5. Results and Discussion

5.1 Socio-Demographic Characteristics of the Respondents

Information on some socio-demographic characteristics namely age, sex, education level, marital status and household size were obtained. Socio-demographic characteristics of the respondents are found to be very important variables in most behavioural and attitudinal studies. The summary on the socio-demographic characteristics of the respondents is provided in Table 1. The results reveal that 42.1% of the interviewed respondents were aged between 21 to 39 years, 26.3% were between 40 to 49 years while 17.1% were between 50-59 years, 10.7% were between 60-69 years and 3.8% were above 70 years. The average age was 43.7 years, and the highest age and the lowest age were 21 and 72 respectively. The sample of the respondents interviewed comprised of 47.9% men and 52.1 % women. Slightly more than one-third (39.2%) of the respondents had not gone to school at all, 2.5 had Universal adult education , where as 30.0% completed primary school education, 8.8 % had attained secondary education, 10.4% had Post-secondary/vocational education and 9.2% had graduated from universities. Of the interviewed respondents, about 57.5% of the respondents were married, while only 1.7% were separated, 30.4% were never married/single. Others were 5.4 %, 2.5%, 0.8% and 1.7% who were widow, widower, ccohabitating and too young to marry. In terms of household size (total number of household members) the mean household size was 5 members with lowest household size (minimum) with 1 member and the highest household size (maximum) with 10 members.

Table 1: Socio-demographic characteristics of the respondents (n=240)

Variable	Categories	Percentage
Age in years	21-39	42.1
	40-49	26.3
	50-59	17.1
	60-69	10.7
	> 70	3.8
Level of Education	Not gone to school at all	39.2
	Universal adult education	2.5
	Primary school	30.0
	Secondary school	8.8
	Post-secondary /vocational	10.4
	University	9.2
Sex	Male	47.9
	Female	52.1
Marital status	Never married/Single	30.4
	Married	57.5
	Separated	1.7
	Widow	5.4
	Widower	2.5
	Cohabiting	0.8
	Too young to marry	1.7
Household size	1-3	21.7
	4-7	65.9
	> 8	12.4

5.2 Attitudes towards Health Behaviour under One Health Approach

Statements on Knowledge, Attitudes and Practices on health behaviours were subjected to attitudinal measurement using Likert scale. The summary of results for total attitudinal scores are presented in Table 2, whereby the mean score was 114.5250, the minimum score was 103 while the maximum score was 131 with the Std. Deviation of 6.79646.

Table 2 Total Attitudinal Scores

Scores	Frequency	Percent
103.00	12	5.0
105.00	12	5.0
106.00	12	5.0
107.00	6	2.5
108.00	6	2.5
110.00	18	7.5
111.00	6	2.5
112.00	24	10.0
113.00	6	2.5
114.00	36	15.0
115.00	12	5.0
116.00	6	2.5
117.00	12	5.0
118.00	18	7.5
119.00	6	2.5
121.00	12	5.0
122.00	6	2.5
123.00	6	2.5

125.00	12	5.0
131.00	12	5.0
Total	240	100.0

Using SPSS (v20) the scores were cut into 3 equal groups to represent group of attitudes towards health behaviours, into unfavourable (negative), neutral (undecided) and favourable (positive) attitudes. The scores which were below 112 represented respondents who had unfavourable (negative) attitude towards health behaviours, whereas scores ranging 112 to 117 represented neutral (undecided) attitudes and the score above 117 represented respondents who had positive attitudes towards health behaviours. The overall results for attitudinal scores after being categorized into three (3) categories are presented in Table 3, whereas 30% of respondents had negative (unfavourable) attitude towards health behaviours, 35% of the respondents had positive (favourable) attitude and 35% were undecided hence neutral attitude towards health behaviours.

Table 3 Attitudes towards Health Behaviours (n= 240)

	Frequency	Percent (%)
Favourable (positive) attitude (Above 117)	84	35.0
Neutral (undecided) attitude (Between 112-117)	84	35.0
Unfavourable (negative) attitude (Below 112)	72	30.0
Total	240	100.0

5.3 Measurement of Health Behaviour

A respondent was asked whether in the past 3 months has ever involved himself in habits/practices which could impair ones health. To determine the overall level of health behaviour an index was developed using 38 health behaviour variables which reflected habits/practices that could impair health. These were variables which were obtained from a review of literature. For each variable , every “Yes” response was coded 1, , while a “No” response was coded 0 That means a Yes response on a variable signifies and individuals involvement in health impairing behaviour , every No response represented non involvement in health impairing behaviour hence Health Enhancing behavior. The scores were computed after transforming all Yes responses from value of 1 to 2 and all No responses from value of 0 to 1. Mean score was computed and all the scores below the mean value signified low level of involvement in health impairing practices hence exhibiting a health enhancing behaviours, while all those scores above the mean signified high level of involvement in health impairing practices hence exhibiting health impairing behaviours. The mean score was 23.4500; the minimum score was 12 while the maximum score was 30 with the Std. Deviation of 4.64947. Table 4 presents categories of Health Behaviours.

Table 4: Categories of Health Behaviours (n=240)

Category of behavior	Frequency	Percent
Health Enhancing Behaviours (Low Impairing practices)	96	40.0
Health Impairing Behaviours (Low Health Enhancing practices)	144	60.0
Total	240	100.0

The results in Table 4 reveal that 60% of the respondents interviewed had exhibited health impairing behaviours while 40% had health enhancing behaviours. Summary of scores is presented in Table 5.

Table 5: Health behaviours scores (n=240)

Scores	Frequency	Percent
12.00	6	2.5
13.00	6	2.5
14.00	6	2.5
16.00	6	2.5
19.00	24	10.0
20.00	24	10.0
21.00	12	5.0
22.00	6	2.5
23.00	6	2.5
24.00	18	7.5
25.00	36	15.0
26.00	12	5.0
27.00	30	12.5
28.00	18	7.5
29.00	18	7.5
30.00	12	5.0
Total	240	100.0

5.4 Association of Attitudes and Health behaviour

The association of Attitudes and Health behaviour was determined using cross-tabulation and chi-square analysis. Cross tabulation results are presented in Table 6. The results indicate that health impairing behaviours (Low Health Enhancing practices) were higher among those with favourable attitudes towards health impairing behaviours constituting 27.5% while health enhancing behaviours were higher among respondents with unfavourable attitudes towards health impairing behaviours constituting 22.5%. The results indicate an association between attitudes and health behaviours, much as Low Health Enhancing practices were found with people who also had favourable attitudes towards such health impairing practices/habits and vice versa. These findings conform to findings from other studies ([10], [1] which also indicated an association between attitudes and health. In this study however the differences between various attitudinal categories on health impairing practices/ habits was very marginal to the extent that the claim that attitudes have predictive priority over behavior [6] seems not to be valid in this context. The details are presented in Table 6.

Table 6: Association between Attitudes and Health Behaviours (n=240)

Groups of attitude	Health Behaviours Categories		Total
	HEB (Low Health Impairing practices)	HIB (Low Health Enhancing practices)	
Favourable (positive) attitude	7.5 (18)	27.5 (66)	35 (84)
Neutral (undecided) attitude	10.0 (24)	25.0 (60)	35 (84)
Unfavourable (negative) attitude	22.5 (54)	7.5 (18)	30 (72)
Total	40 (96)	60 (144)	240

The results from a Chi-square tests indicated a significant association between attitudes and health behaviours at household level with p-value= 0.001. Previous studies [24], [10],[1],[6],[11],[12] also acknowledge an existence of an association between attitudes and health behaviour.

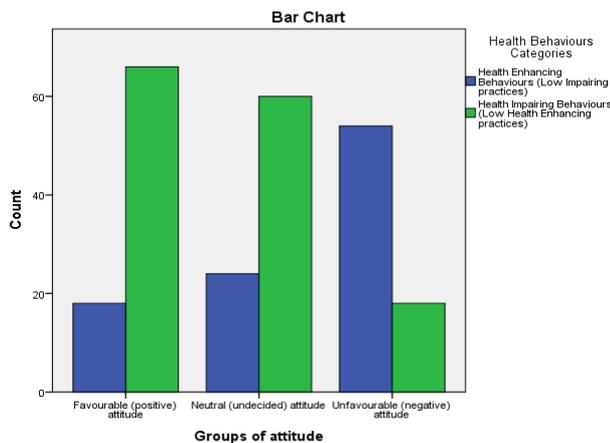


Figure 1: Association of Attitudes and Health Behaviour

5.5 Magnitude of relationship between attitudes and health behaviours

Correlation coefficient was measured to establish the robustness of the relationship between attitudes and health behaviours. Pearson's correlation coefficient is one of the most commonly used correlation coefficients and measures the linear relationship between two variables. The value of the correlation coefficient, denoted as r, ranges from -1 to +1, which gives the strength of the relationship and whether the relationship is negative or positive. When the value of r is greater than zero, (a positive relationship as one increases, the other will increase); and less than zero, (a negative relationship if one variable increases, the other decreases). A value of zero indicates that there is no linear relationship between the two variables; it is possible that the variables have a strong curvilinear relationship. The results from a statistical measure of relationship between attitudes and health behaviours indicated a significant correlation, with r= .235, and p< 0.01. Observations from a regression model indicate that health behavior depends strongly on other moderator variables including Health Literacy Levels which was found to be significant

correlated at -2.50793 and p-value at <0.0001. This finding is in line with other studies ([13] [14] [15] who declare that the influence of attitude on behavior also depends strongly on moderator variables.

Model 2: Ordered Logit, using observations 1-240
Dependent variable: Health Behaviour Categories QML standard errors

	Coefficient	Std. Error	z	p-value
Age	0.0027013	0.015356	0.1759	0.8604
Sex	-0.022007	0.416155	-0.05288	0.9578
Marital Status	-0.120635	0.153115	-0.7879	0.4308
Highest education~ Occupation	-0.165825	0.100859	-1.644	0.1001
Household Size	-0.085612	0.108079	-0.7921	0.4283
One Health Concern	-0.354922	0.244600	-1.451	0.1468
Health Literacy Levels	-2.50793	0.458932	-5.465	<0.000 **
Info Seeking	-0.087897	0.373156	-0.2356	0.8138
Discussion on Health Related aspects	-0.379713	0.359879	-1.055	0.2914
Interaction with Medical Personnel	0.545106	0.340970	1.599	0.1099
Group Attitude	-1.97263	0.471813	-4.181	<0.000 **
cut1	-11.1313	2.67992	-4.154	<0.000 **

6. Ethical Considerations

Researcher clarified the purpose of the study to the local government and village leaders also obtained written informed consent from the participants. Participants were assured of their anonymity in that none of information from them will be attributed to their names.

7. Conclusion

It is now understood that attitudes can predict behavior, but only if the measure of behavior is broadly representative of the attitude domain. Individual behaviors performed in a particular context tend to be influenced not only by general attitudes but by a wide range of additional factors. It is difficult to determine any one variable or explanation which accurately answers why attitude does not always predict behaviour rather it is a combination of factors that lead to attitude-behaviour inconsistency. Attitude is complex and relates to behaviour in many ways rather than having a direct connection and is affected by both internal and external influences.

8. Acknowledgement

We are indebted to the local community and the district administration at Morogoro urban and Mvomero districts for their support during data collection. We are very grateful to the Intra -ACP Academic Mobility Scheme under the EU which offered scholarship for PhD studies

that led to this paper. We thank Sokoine University of Agriculture (SUA) and the University of Zambia (UNZA) for coordinating this program. We also thank colleagues at the Department of Population Studies at School of Humanities and Social Science (UNZA) and Department of Development Studies at the College of Social Sciences and Humanities (SUA) for their valuable help and support during data analysis. Any errors or omissions are the faults of the authors

9. References

- [1] I. Ajzen, M. Fishbein, "Understanding attitudes and predicting social behavior", Prentice-Hall, Englewood Cliffs, NJ, 1980.
- [2] A.W.Stacy, K.F.Widaman, G. A Marlatt, "Expectancy models of alcohol use", *Journal of Personality and Social Psychology*, 58, pp. 918-928, 1990.
- [3] G.S. Barkley, "Factors influencing health behaviors in the National Health and Nutritional Examination Survey", III (NHANES III), *Soc Work Health Care*, 46(4), pp.57-79, 2008).
- [4] A. Baum, D.M.Posluszny, "Mapping Biobehavioral Contributions to Health and Illness, *Annu. Rev. Psychol.* 50,pp.137–163 *HEALTH PSYCHOLOGY: Behavioral Medicine and Oncology*, 1999.
- [5] Z. Yin, G. Geng, X. Lan, L. Zhang, S. Wang, Y. Zang, and M. Peng, "Status and determinants of health behavior knowledge among the elderly in China: a community-based cross-sectional study", *BMC Public Health* 13:710, 2013.
- [6] P. M. Bentler, and G. Speckart, Attitudes "cause" behaviors: A structural equation analysis. *Journal of Personality and Social Psychology*, 40, pp.226-238, 1981.
- [7] S. M. Corey, "Professed attitudes and actual behavior," *Journal of Educational Psychology*, 28(4), pp. 271-280, 1937.
- [8] R. T. LaPiere, "Attitudes vs. Actions" *Social Forces*, 13, pp. 230-237, 1934.
- [9] A. W. Wicker, "An examination of the "other variables" explanation of attitude-behavior inconsistency", *Journal of Personality and Social Psychology*, 19, pp. 18-30, 1971.
- [10] M. Fishbein, & I. Ajzen, "Belief, attitude, intention, and behavior: An introduction to theory and research". Reading, MA: Addison-Wesley, 1975.
- [11] D. J. Bern, "Self-perception theory", In *Cognitive theories in social psychology*, (pp. 221-282), L. Berkowitz (ed.), San Diego, CA:Academic Press, 1978.
- [12] H. C. Kelman, "Attitudes are alive and well and gainfully employed in the sphere of action", *American Psychologist*, 29, pp. 310-324, 1974.
- [13] R. H Fazio, and C. J Williams, "Attitude accessibility as a moderator of the attitude-perception and attitude-behavior relations: An investigation of the 1984 presidential election", *Journal of Personality and Social Psychology*, 51, pp. 505-514, 1986.
- [14] A. W. Stacy, C. W. Dent, S. Sussman, A. Raynor, D. Burton, and B. R. Flay, "Expectancy accessibility and the influence of outcome expectancies on adolescent smokeless tobacco use", *Journal of Applied Social Psychology*, 20, pp. 802-817, 1990.
- [15] M. Snyder, "The self-monitoring of expressive behavior," *Journal of Personality and Social Psychology*, 30, pp. 526-537, 1974.
- [16] J. N. Bassili, "Response latency and the accessibility of voting intentions: What contributes to accessibility and how it affects vote choice", *Personality and Social Psychology*, Vol 71 (4), pp. 637-653, 1995.
- [17] B. Six, and T. Eckes, "Attitude-behavior relations: A comprehensive meta-analysis of 887 studies published between 1927 and 1993,". Paper presented at the XXVI International Congress of Psychology, Montreal, Quebec, Canada, 1996.
- [18] M.T. Wallace, T.J. Perrault (Jr), W.D. Hairston, B.E. Stein, "Visual experience is necessary for the development of multisensory integration", *J Neurosci*, 24, pp. 9580–9584, 2004.
- [19] D. Albarracín, B.T. Johnson, M. Fishbein, and P.A. Muellerleile, "Theories of reasoned action and planned behavior as models of condom use: A meta-analysis", *Psychological Bulletin.*;127(1),pp.142–161, 2001.
- [20] S. Oskamp, "Attitudes and opinions", 2nd Edition. Prentice Hall, 499 pages, 1991.
- [21] M.P.Zanna, J.M. Olson, and R.H. Fazio, "Self-Perception and Attitude-Behavior Consistency", *Personality and Social Psychology Bulletin*, Vol 7, Issue 2, 1981.
- [22] I. Ajzen, and C. Timko, (1986). Correspondence between health attitudes and behavior. *Basic and Applied Social Psychology*, 7(4), pp. 259-276.
- [23] K. S. Courneya, "Understanding readiness for regular physical activity in older individuals: An application of the theory of planned behavior",. *Health Psychology*, 14, pp. 80-87, 1995.
- [24] I. Ajzen, and M. Fishbein, The influence of attitudes on behavior, in "The handbook of attitudes" (pp. 173–221), D. Albarracín, B. T. Johnson, and M. P. Zanna (eds.),. Mahwah, NJ: Erlbaum Publishers, 2005.

- [25] N. Altman, and M. Krzywinski, "Points of Significance: Association, Correlation and Causation", *Nature Methods*, Vol.12 (10), 2015.
- [26] J. M. Olson, and M. P. Zanna, Attitudes and attitude change, *Annual Review of Psychology*,44, pp. 117-154, 1993.
- [27] J.N. Bassili and J.P. Roy, "On the representation of strong and weak attitudes about policy in memory", *Polit. Psychol.*19,pp. 669–81, 1998.
- [28] S. J. Breckler and E. C. Wiggins, "Affect versus evaluation in the structure of attitudes", *Journal of Experimental Social Psychology*, 25, 253–271, 1989.
- [29] D. M. Sanbonmatsu and R. H. Fazio, "The role of attitudes in memory- based decision making", *Journal of Personality & Social Psychology*, 59, pp. 614- 622, 1990.
- [30] M. Conner, and P. Norman, (eds.) *Predicting Health Behaviour*. Buckingham, UK: Open University Press, 1996.
- [31] A. Papadopoulos, and S. Wilmer, "One Health: A Primer, National Collaborating Centre for Environmental Health, 2011", http://ncceh.ca/sites/default/files/One_Health_Primer_Nov_2011.pdf [accessed April 13, 2013]
- [32] American Veterinary Medical Association, (AVMA), "One Health Initiative Task Force. One Health: A new professional imperative. Schaumburg, IL: AMVA; 2008. Available from: http://www.avma.org/onehealth/onehealth_final.pdf
- [33] E.V. Mbugi, B.Z. Katale, S. Kendall, L Good, G.S. Kibik, J.D. Keyyu, et al., "Tuberculosis cross-species transmission in Tanzania: Towards a One-Health concept", *Onderstepoort Journal of Veterinary Research*, 79(2), 2012, Art. #501, 6 pages. <http://dx.doi.org/10.4102/ojvr.v79i2.501>
- [34] I. Ajzen, "From intentions to actions: A theory of planned behaviour", in *Action control: From cognition to behaviour*, J. Kuhl and J. Beckman (eds), pp. 11-39, 1985.
- [35] I. Ajzen, "Attitudes, personality, and behavior", Homewood, IL:Dorsey Press, 1988.
- [36] I. Ajzen, and T. J. Madden, "Prediction of goal directed behavior: Attitudes, intention, and perceived behavioral control", *Journal of Experimental Social Psychology*, 22, pp. 453–474, 1986.
- [37] I. Ajzen, *The theory of planned behavior*, 2002. Retrieved from <http://www.people.umass.edu/ajzen>. [Accessed: Sept. 26, 2016].
- [38] J. Ogden, "Some problems with social cognition models: A pragmatic and conceptual analysis", *Health Psychology*, 22, pp. 424–428, 2003.
- [39] N.D. Weinstein, "Reducing unrealistic optimism about illness susceptibility", *Health Psychology*, 2, pp. 11-20, 1983.
- [40] N.D. Weinstein, "Why it won't happen to me: Perceptions of risk factors and susceptibility" *Health Psychology*, 3, pp. 431- 437, 1984.
- [41] I. Ajzen, and M. Fishbein, "Attitude–behavior relations: A theoretical analysis and review of empirical research", *Psychological Bulletin*, 84, pp. 888–918, 1977.
- [42] J.T. Siegel, M.A. Navarro, C.N. Tan, and M.K. Hyde, "Attitude–Behavior Consistency, the Principle of Compatibility, and Organ Donation: A Classic Innovation. *Health Psychology*," *American Psychological Association*, Vol. 33, (9), pp. 1084–1091, 2014.
- [43] Tanzania-NBS, "2012 Population and Housing Census; Population Distribution by Administrative Areas", National Bureau of Statistics, Dar es Salaam, Tanzania, 2013, Available at: http://www.nbs.go.tz/sensa/PDF/Census%20General%20Report%20%2029%20March%202013_Combined_Final%20for%20Printing.pdf (Accessed 21 May 2014)
- [44] E.D. Karimuribo, L.J. Kusiluka, R.H. Mdegela, A.M. Kapaga, C. Sindato, and D.M. Kambarage, "Studies on mastitis, milk quality and health risks associated with consumption of milk from pastoral herds in Dodoma and Morogoro regions, Tanzania", *J. Vet. Sci* 6(3), pp.213–221, 2005.
- [45] C.R. Kothari, "Research Methodology (Methods and Techniques)"-2nd Revised Ed. New Age International (P) Limited, Publishers, New Delhi, India, 2004.
- [46] K.D. Bailey, *Methods of social research*, (4th ed.), The Free Press, New York, 1994.
- [47] M. Fishbein, H. C. Triandis, F. H. Kanfer, M. Becker, S.E. Middlestadt, and A. Eichler, "Factors influencing behavior and behavior change", in *Handbook of health psychology* (pp. 3–17, A.Baum, T. A. Revenson and J. E. Singer (eds.), 2001.
- [48] J.B. Muma, K.L Samui, J. Oloya, M. Munyeme and E Skjerve, "Risk factors for brucellosis in indigenous cattle reared in livestock-wildlife interface areas of Zambia", *Prev Vet Med*, 80, pp. 306-317, 2007.
- [49] M. Munyeme, J.B. Muma, E. Skjerve, A.M. Nambota, I.G Phiri, K.L Samui, P. Dorny and M. Tryland, "Risk factors associated with bovine tuberculosis in traditional cattle of the livestock/wildlife interface areas in the Kafue basin of Zambia". *Prev Vet Med*, 85 (3-4), pp.317-328. 2008.

- [50] Muma J.B., K.L. Samui, V.M. Siamudaala, J. Oloya, G. Matop, M.K. Omer, M. Munyeme, C. Mubita & E. Skjerve Prevalence of antibodies to *Brucella* spp. and individual risk factors of infection in traditional cattle, goats and sheep reared in livestock-wildlife interface areas of Zambia. *Trop Anim Health Prod*, 38, pp. 195-206, 2006.
- [51] J. Oloya, J. Opuda-Asibo, R. Kazwala, A.B. Demelash, E. Skjerve, A. Lund, T.B. Johansen & B. Djonne, "Mycobacteria causing human cervical lymphadenitis in pastoral communities in the Karamoja region of Uganda," *Epidemiol Infect*, 136, pp. 636-643, 2008.
- [52] R.R. Kazwala, C.J. Daborn, L.J.M. Kusiluka, S.F.H. Jiwa, J.M. Sharp, D.M. Kambarage, "Isolation of Mycobacterium species from raw milk of pastoral cattle of southern highlands of Tanzania", *Tropical Animal Health and Production*, 30, pp. 233-239, 1998.
- [53] S. Cleaveland, D.J. Shaw, S.G. Mfinanga, G. Shirima, R.R. Kazwala, E. Eblate, and Sharp M, "Mycobacterium bovis in rural Tanzania: risk factors for infection in human and cattle populations" *Tuberculosis*, 87(1), pp.30-43, 2007.
- [54] K. Mwacalimba, "Pandemic preparedness and multi-sectoral zoonosis risk management: implications for risk assessment of avian influenza in Zambia Trade, Health and Agriculture", Lap Lambert Academic Publishing, 2013.
- [55] F. X. Meslin, K. Stohr, and D. Heymann, "Public health implications of emerging zoonoses," *Rev Sci Tech* 19, pp. 310-317, 2000.
- [56] D.M. Pfukenyi, D. Pawandiwa and U. Ushewokunze-Obatoluc, A retrospective study of rabies in humans in Zimbabwe, between 1992 and 2003, *Acta Trop*, 102, pp. 190-196, 2007.
- [57] R.W.S. Fynn, and T.G. O'Connor, Effect of stocking rate and rainfall on rangeland dynamics and cattle performance in a semi-arid savanna, South Africa. *Journal of Applied Ecology*, Volume 37(3), pp. 491-507, 2000).
- [58] H.M. Munang'andu, V.M. Siamudaala, A. Nambota, J.M. Bwalya, M. Munyeme, A.S. Mweene, A. Takada and H. Kida, "Disease constraints for utilization of the African buffalo (*Syncerus caffer*) on game ranches in Zambia", *Jpn J Vet Res*, 54, pp. 3-13, 2006.
- [59] V.M. Siamudaala, J.B. Muma, H.M. Munang'andu and M. Mulumba 2003, "Veterinary challenges regarding the utilisation of the Kafue Lechwe (*Kobus leche kafuensis*) in Zambia", In *Conservation and development interventions at the Wildlife/Livestock Interface: implications for wildlife, livestock and human health*, Durban, South Africa, 14th- 15th September pp. 75-80, 2003.
- [60] V.M. Siamudaala., E.M. Kapungwe and K.L. Samui, "The game ranching industry in Zambia: an overview", *Zam J Vet Sci*, 4, pp. 41-44, 2004..
- [61] M. B. Hang'ombe, M. Munyeme, C. Nakajima, Y. Fukushima, H. Suzuki, W. Matandiko, A. Ishii, A.S. Mweene, and Y. Suzuki, "Mycobacterium bovis infection at the interface between domestic and wild animals in Zambia", *BMC Veterinary Research* 8(221), 2012).
- [62] J. Keiser, M.C. De Castro, M.F. Maltese, R. Bos, M. Tanner, B.H. Singer, J. Utzinger, "Effect of irrigation and large dams on the burden of malaria on a global and regional scale", *Am J Trop Med Hyg.* 72(4), pp. 392-406, 2005.
- [63] J. Yasuoka, T.W. Mangione, A. Spielman and R. Levins, "Impact of education on knowledge, agricultural practices, and community actions for mosquito control and mosquito-borne disease prevention in rice ecosystems in Sri Lanka", *Am. J. Trop. Med. Hyg.*, 74, pp.1034-1042, 2006.
- [64] W.R. Mukabana, K. Kannady, J. Ijumba, Kiama, G 'M ,Ijumba, J.N, Mathenge, E.M, Kiche, I, Nkwengulila, G, Mboera, L, Mtasiwa, D, Yamagata, Y, van Schayk, I, Knols, B.G.J, Lindsay, S.W, de Castro, M.C, Mshinda, H, Tanner, M, Fillinger, U and Killeen, G. F. (2006) Ecologists can enable communities to implement malaria vector control in Africa. *Malaria Journal* 5, (9)
- [65] H. Minja, J.A. Schellenberg, O. Mukasa, R. Nathan, S. Abdulla, H. Mponda, M. Tanner, C. Lengeler, B. Obrist, "Introducing insecticide-treated nets in the Kilombero Valley, Tanzania: the relevance of local knowledge and practice for an Information, Education and Communication (IEC) campaign," *Tropical Medicine & International Health*, 6, pp. 614-623, 2001.
- [66] F. Nuwaha, "People's perception of malaria in Mbarara, Uganda", *Trop Med Int Health*, 7 (5), pp. 462-70, 2002.
- [67] L. Oberländer, and B. Elverdan, "Malaria in the United Republic of Tanzania: cultural considerations and health-seeking behaviour", *Bull World Health Organ*, 78(11), pp. 1352-7, 2000.
- [68] C. Vundule, and S. Mharakurwa, "Knowledge, practices, and perceptions about malaria in rural communities of Zimbabwe: Relevance to malaria control", *Bulletin of the World Health Organization*, 74(1), 55-60, 1996).
- [69] P. Opiyo, W.R. Mukabana, I. Kiche, , E.M. Mathenge, G.F. Killeen, U. Fillinger, "An exploratory study of community factors relevant for participatory malaria control on Rusinga Island, western Kenya", *Malaria Journal*, 6(48), 2007.

- [70] C. R. Ribbands, "Man's Reaction to Mosquito Bites, Nature 158, pp. 912-913, 1946.
- [71] N. D. Weinstein, "Testing four competing theories of health protective behavior," Health Psychology, 12, pp. 324-333, 1993.
- [72] J. Rushton, B. Philippe, J. Charles, M. Pressley, "Behavioral development and construct validity: The principle of aggregation," Psychological Bulletin, Vol 94(1), pp.18-38, 1983.

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