Food Practices and Respiratory Illnesses: A Basis for Managing the Health Effects of Climate Change

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Abstract— This study was undertaken to find a significant relationship between food preparation, selection, and composition practices of children (3-6) of Bangued , Abra to their experiences of climate –related illnesses like cough , colds and pneumonia for the year 2015. Results of descriptive-correlational questionnaire design showed these children oftentimes perform the practices in food preparation, selection, and composition ($\bar{x}$ = 3.11). There's significant positive correlation of cough experience (r = 0.179) with the practices and tells that even they observe often those practices there still an increased incidence of cough experience. Meanwhile, a significant negative correlation is found linking the frequency of colds experience to the practices (r = -0.199) which means that doing it often can prevent the colds from recurring. Furthermore, the usual month of cough- August (r = -0.291), and of pneumonia- July (r = -0.209), also reveal a significant negative correlation which implies that the lower incidence of the children's respiratory illnesses that happen during these rainy months are due to their good observation on those practices. The results of this study suggest that food choices and weather conditions in Bangued, Abra, affect the incidence of aforementioned respiratory illnesses of these children..

Index Terms— children 3-6 year old; food ; respiratory illnesses; Bangued, Abra ; Philippines.

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1 INTRODUCTION

IT has been said that everyone will be impacted by climate change. The Intergovernmental Panel on Climate Change or IPCC [12], projected that…

…climate change-related exposures are likely to affect the health status of millions of people, particularly those with low adaptive capacity, through: increases in malnutrition and consequent disorders, with implications for 'child growth and development'; and the 'increased frequency of cardio-respiratory diseases due to higher concentrations of ground level ozone related to climate change'…

People will suffer from these damages of the environment and it is the respiratory system that will be primarily affected. People with less ability to respond to the environmental and public health impacts of climate change will be most impacted (Snover *et.al.,* [23]). Children, specifically the young ones, are one of the weakest groups in the population that could adapt to the health impacts of climate change. It is because of their still developing respiratory system that they intend to inhale more air than the normal adults. Also, because of their short stature they breathe air near to the ground where most ozone is concentrated.

According to WHO [30] that "approximately one in five deaths around the world each year occurs in a child < 5 years of age" and their leading cause of death are acute respiratory infections (WHO, [30]).

The acute respiratory tract infections (RTIs) are the earliest form of disease that strikes when the respiratory system is irritated. It is an infection of the sinuses, throat, airways or lungs and the most widespread RTI is the common cold (www.nhs.uk, 2015). Risk factors that leads to irritation and infection of the sinuses, throat, airways or lung are: colds viruses, young age, poor immune system, and time of the year (Mayo Clinic, [13]). The same author stated that…

Infants and preschool children are especially susceptible to common colds because they haven't yet developed resistance to most of the viruses that cause them". They also mentioned that" as people age, they develop immunity to many of the viruses that cause common colds". Also, he added that "in warmer climates where cold weather doesn't keep people inside, colds are more frequent in the rainy season".

It seems that a wet environment can harbor lots of viruses that can cause respiratory infections. As what du Prel *et.al.*[10] has stated "seasonality of certain acute respiratory infection (ARI) pathogens can be due to meteorological influences ". Regarding the climate of the Philippines, Philippine Atmospheric, Geophysical and Astronomical Services Administration or PAGASA [18] reported that is "tropical and maritime". They added that…

Using temperature and rainfall as bases, the climate of the country can be divided into two major seasons: (1) the rainy season, from June to November; and (2) the dry season, from December to May. The dry season may be subdivided further into (a) the cool dry sea-

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son, from December to February; and (b) the hot dry season, from March to May.

Bangued, Abra, on the other hand, according to Zamboanga.com [34], "has a climate that falls under the first type of tropical climate which has the maximum rain period from June to September". This province is really blessed with an equal partition of dry and wet seasons. This study will try to see if there is an effect of these dry and wet seasons of this locality to the children's experiences of respiratory illnesses like cough, colds and pneumonia.Also the ways of how to protect the children of Bangued, Abra from these climate change impacts drive the researchers to conduct this study. The results will help inform the residents of Bangued, Abra in matters of health awareness through the barangay health centers. In this way, they will be educated on how to protect their children from the ill effects of climate change. Through seminars, they will be encouraged to observe and apply these health practices to promote good health on their young amidst the harsh changing climate.

2 OBJECTIVES OF THE STUDY

The study determined the level of health practices of the children of Bangued, Abra in preparation for a changing climate. Specifically, it determined the level of health practices of children in Bangued, Abra in terms of food preparation, selection, and composition. Next, it determined the proportion of children experiencing the respiratory illnesses like cough, colds, and pneumonia. Third, it has determined the incidence of respiratory illness of the children in terms of duration, frequency in a month, and usual month of illness in the calendar year 2014. Then lastly, it has determined if there is a significant relationship between the experiences of climate – related illness in 2014 of the children to their level of their health practices on food preparation, selection, and composition.
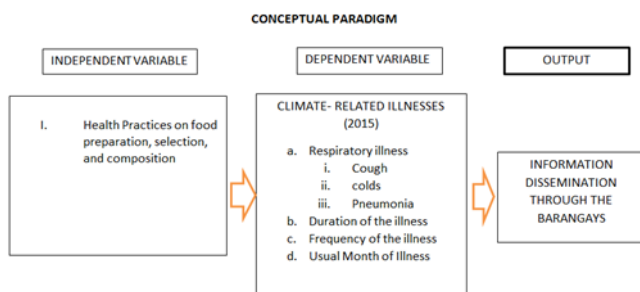
3 CONCEPTUAL FRAMEWORK

Figure 1. Research Paradigm

This study will have the climate-related illnesses as the dependent variable and food preparation, selection, and composition as the independent variable. Results of the study will then be disseminated through the barangay health centers.

4 METHODOLOGY

This study used a descriptive correlational design to find out the relationship of the Bangued, Abra's children's climate-related illnesses in the 2015 to their food preparation, selection, and composition. It employed a convenient sampling of children 3 year old up to 6 years of age only which were residing in Bangued, Abra. It utilized a questionnaire with two parts. First was an adopted health practice survey questionnaire from the study Espiritu [36] entitled "*Health Practices of Children (3-6) in Relation to Nutritional Status*". Then the next part contained the experiences of the children on climate-related illnesses specifically on cough, colds and pneumonia for the 2015.

The norm of interpretation, which is shown below, is a four-point rating scale for the level of health practice of the children (3-6) of Bangued, Abra on food selection, composition and preparation.

Point Value	Statistical Limits	Descriptive Rating (DR)
4	3.25 − 4.00	Always Practiced
3	2.50 − 3.24	Often Practiced
2	1.75 − 2.49	Seldom Practiced
1	1.00 − 1.74	Never Practiced

For the statistical tool and treatment, this study utilized frequency count, mean, and multiple regression and simple descriptive correlation to find out the relationship of the Bangued, Abra's children's climate-related illnesses for the year 2014 to their health practice on food preparation, selection, and composition.

5 RESULTS AND DISCUSSIONS

This study determined the level of health practices on food preparation, selection, and composition of the children (3-6) of Bangued, Abra in preparation for a changing climate. Table 1 presents the level of health practices on food preparation, selection, and composition of children (3 – 6 years old) in Bangued, Abra in preparation for a changing climate.

Table 1
Level of Health Practices of Children (3 – 6 years old) in Bangued, Abra
In Terms Of Food Preparation ,Selection, and Composition

A. Food Preparation ,Selection, and Composition	Mean (x)	Descriptive Rating (DR)
1. Goes to the table promptly as soon as the child is called to eat.	3.14	OP
2. Washes hands before eating	3.61	AP
3. Uses fork and spoon when eating	2.92	OP
4. Eats green leafy vegetables like pechay, malunggay, etc.	2.84	OP
5. Eats oranges, guavas and other vit. C rich foods.	3.02	OP
6. Eats food rich in calcium and phosphorus like milk, eggs and legumes.	3.25	AP
7. Eats foods that are thoroughly washed and uncontaminated by flies and insects.	3.04	OP
8. Drinks six to eight glasses of water every day.	3.03	OP
9. Drinks milk.	3.04	OP
10. Eats one cup of rice in each meal.	3.07	OP
11. Eats meat and fish.	3.28	AP
Overall Mean	**3.11**	**OP**

Norm:

Point Value	Statistical Limits	Descriptive Rating (DR)
4	3.25 – 4.00	Always Practiced
3	2.50 – 3.24	Often Practiced
2	1.75 – 2.49	Seldom Practiced
1	1.00 – 1.74	Never Practiced

Table 2a shows that the children (3 – 6 years old) in Bangued, Abra are often observing these health practices on food preparation, selection, and composition with an over-all mean of 3.11. Taking it singly, the children always wash their hands before eating ($\bar{x} = 3.61$) ; they always eat fish and meat ($\bar{x} = 3.28$); and they always eat foods rich in calcium and phosphorus like milk, eggs and legumes ($\bar{x} = 3.25$). Unfortunately, this table also displays that these children eat oftentimes oranges, guavas and other vit. C rich foods ($\bar{x} = 3.02$) ; oftentimes use fork and spoon when eating ($\bar{x} = 2.92$) ;oftentimes eat green eat leafy vegetables like pechay, malunggay, etc. ($\bar{x} = 2.84$). This means that these children lack the essential nutrients from the green leafy vegetables and vitamin C rich foods that help boost their immune system in fighting against sickness. Also they only often use fork and spoon when eating that could probably one reason where microbes and viruses entered the body that could cause illness.

Next, it will determine the proportion of children (3-6) in Bangued, Abra who experienced respiratory illnesses for the year 2014. Table 2 presented the proportion of children (3-6) in Bangued, Abra who experienced respiratory illnesses for the year 2014.

Table 2
Proportion of Children with Respiratory Illnesses for the year 2015

	Respiratory Illness					
	Cough/Uyek		Colds/Panateng		Pneumonia/pulmonya	
	(f)	(%)	(f)	(%)	(f)	(%)
Yes	107	93.86	104	91.23	4	3.51
No	7	6.14	10	8.77	110	96.49
Total	114	100.00	114	100.00	114	100.00

Table 2a showed that most children experienced cough (107), colds (104) and without pneumonia (110) with a percentage of 93.86%, 91.23% and 96.49% respectively. On the other hand, few of them did not experience cough (7), and colds (10) with 6.14% and 8.77% corre-

spondingly. However, it is vital to consider that there were four (4) children who suffered pneumonia (3.51%) for the year 2015. Pneumonia according to www.lung.org [3] is usually an exacerbation of a respiratory infection. Probably some of those children with cough and colds were not in good shape by the time they were afflicted with these infections that led them to experience pneumonia.

Table 3 presented the incidence of respiratory illnesses of children in terms of duration, frequency and usual month of occurrence.

Table 3
Incidence of Respiratory Illnesses of Children
in terms of Duration, Frequency and Usual Month of Occurrence

Variables		Cough		Colds		Pneumonia	
		(f)	(%)	(f)	(%)	(f)	(%)
Duration of Illness	None	7	6.14	10	8.77	110	96.49
	< 6 days	76	66.67	65	57.02	2	1.75
	1 week	20	17.54	31	27.19	2	1.75
	> a week	11	9.65	8	7.02	0	0.00
	Total	114	100.00	114	100.00	114	100.00
Frequency of Illness in a Month	None	7	6.14	10	8.77	110	96.49
	Once	77	67.54	71	62.28	2	1.75
	Twice	26	22.81	28	24.56	1	0.88
	Frequent	4	3.51	4	3.51	1	0.88
	Always	0	0.00	1	0.88	0	0.00
	Total	114	100.00	114	100.00	114	100.00
Usual Month of Illness	January	17	14.91	16	14.04	2	1.75
	February	5	4.39	4	3.51	3	2.63
	March	2	1.75	-	-	-	-
	April	7	6.14	4	3.51	1	0.88
	May	7	6.14	7	6.14	-	-
	June	18	15.79	20	17.54	2	1.75
	July	35	30.70	33	28.95	1	0.88
	August	25	21.93	28	24.56	2	1.75
	September	32	28.07	37	32.46	2	1.75
	October	5	4.39	8	7.02	-	-
	November	2	1.75	9	7.89	-	-
	December	39	34.21	32	28.07	1	0.88

Table 3 revealed that most children (76) experienced cough for less than 6 days(66.67%) and few of them (11) experienced it for more than a week (9.65%). With regards to how frequent in a month they experienced coughing; most children (77) suffer from it twice a month (67.54%) and few of them (4) suffer always (3.51%) in a month. The usual month of coughing experienced by most children (39) is December (34.21%), while the lean months of coughing are March (1.75%) and November (1.75%).

Moreover, this table also displayed that many of these children (65) suffered colds in less than 6 days (57.02%) and only a few (8) battles against it for more than a week (7.02 %). Regarding how frequent the experience of colds in a month, most of these children (71) have it once a month (62.28%) only while the least number of them (1) has it always in a month (0.88%). The usual month of illness by most children (37) is September (32.46 %), while the lean months of colds are February (4:3.51%) and April (4: 3.51%).

Additionally, it is imperative to mention that those children who had pneumonia (2) took one week (1.75%) the most to be healed from it and the others (2) suffered in only

less than 6 days (1.75%). Most of those children (2) had recurrence once in a month (1.75%), while one (1) of those children had recurrence frequently in a month (0.88%). The most month of recurrence is February with a 2.63%.

Based from a data from the annual morbidity report of the RHU in Bangued, Abra, among the notifiable diseases listed for the 2014, pneumonia struck 68 children under 1 year old, 92 children aging 1 year old to 4 year old, and 37 children aging 5 year old to 9 year old. It is alarming to note that there were plenty of them who suffered pneumonia nowadays.

In the Philippines, the cool dry season would start on December that lasts till February and the maximum rains over June to September (PAGASA, [18]). It has been said that cooler air can worsen an existing cough (Thompson , [24]). He further mentioned that "cold dry air makes the airways lose water vapour that causes irritation, wheezing and coughing". Rains, on the other hand, can harbor many acute respiratory pathogens (ARI's) due to wet environment. As what du Prel *et al.*, [10] has concluded in their study that:

" Seasonality of certain ARI pathogens can be explained by meteorological influences. (p. 861-868)"

This means to show that most children were affected by the cold dry air of December and February, and also by the wet month of September.

Lastly, it will seek to determine if there is a significant relationship between the experiences of climate-related illness of children like cough, colds and pneumonia in the year 2015 to the level of their health practices on food selection, composition, and preparation. Table 3a presents the relationship between the experiences of children on climate-related illness in terms of cough to their health practices on food preparation, selection, and composition. It shows that the experience of cough by the children seems to be brought about by their practices on food selection, composition and preparation (r = 0.179). It was found to be significant at 0.05 levels with a positive correlation.

This simply means that the children experience cough because they oftentimes ($\bar{x} = 3.11$) observe the health practices under food preparation, selection, and composition as presented in the table 2a. Though they wash their hands before eating ($\bar{x} = 3.61$) ; they eat fish and meat ($\bar{x} = 3.28$); and foods rich in calcium and phosphorus like milk, eggs and legumes ($\bar{x} = 3.25$), unfortunately, these children does not eat always green leafy vegetables like pechay, malunggay, etc. ($\bar{x} = 2.84$) and oranges, guavas and other vitamin. C rich foods($\bar{x} = 3.02$).

This means that these children lack the essential nutrients from the green leafy vegetables and most especially the vitamin C that comes from oranges and guavas. Vitamin C has been demonstrated to have a strong anti-viral effect. Orthomolecular.org states: "In high doses, vitamin C neutralizes free radicals, helps kill viruses, and strengthens the body's immune system "(Neverman, [16]).

It is also imperative to discuss that it is only in the month of August where significant relationship was found out. The experience of the children in having cough during this month was brought about by their practices (r = -0.291). This finding was found significant at 0.01 level hence, this inverse relationship is highly significant. Therefore, the higher level of observing health practices on food preparation, selection, and composition yielded to a lower incidence of coughing during the month of August despite the fact that it is a rainy season in Bangued, Abra.

Table 3a
Correlation Matrix Showing the Relationship between the Experiences of Climate – related Illness in Terms of Cough of the Children to their Health Practices on Food Preparation, Selection, And Composition

Cough		Health Practices On Food Preparation, Selection, And Composition
	Experience	0.179*
	Duration	0.019
	Frequency	-0.119
months	Jan	0.018
	Feb	0.039
	Mar	-0.088
	Apr	0.047
	May	0.126
	Jun	-0.048
	July	-0.065
	Aug	-0.291**
	Sep	0.068
	Oct	-0.002
	Nov	0.057
	Dec	0.075

Legend:
* - Significant at 0.05 Level of Significance
** - Significant at 0.01 Level of Significance

Table 3b presents the relationship between the experiences of climate – related illness in terms of colds of the children to their health practices on food preparation, selection, and composition seminarsthe electronic material submitted is crucial since the content is not recreated, but rather converted into the final published version.

Table 3b
Correlation Matrix Showing the Relationship between the Experiences of Climate – related Illness in Terms of Colds of the Children to their Health Practices on Food Preparation, Selection, And Composition

Colds		Health Practices On Food Preparation, Selection, And Composition
	Experience	0.057
	Duration	-0.066
	Frequency	-0.199*
	Jan	-0.005
	Feb	0.012
	Mar	-
	Apr	-0.011
	May	0.021
months	Jun	-0.071
	July	-0.036
	Aug	-0.047
	Sep	0.096
	Oct	-0.016
	Nov	-0.001
	Dec	0.021

Legend:
* - Significant at 0.05 Level of Significance
** - Significant at 0.01 Level of Significance

In terms of food preparation ,selection, and composition as an indicator of health practices of the respondents, it yielded to a significant influence to the frequency of occurrence (r = -0.199) of colds as a respiratory illness experienced by the children. This was found to be significant at 0.05 level. This implies that the higher level of practice in food preparation, selection, and composition would confirm a lower frequency of experiencing colds by the children. This finding goes in connection with the findings of Table 2. They oftentimes ($\bar{x} = 3.11$) observe the health practices under food preparation, selection, and composition as presented in the table 2.

They wash their hands before eating ($\bar{x} = 3.61$) ; they eat fish and meat ($\bar{x} = 3.28$); and foods rich in calcium and phosphorus like milk, eggs and legumes ($\bar{x} = 3.25$), fortunately, these children eat often oranges, guavas and other vitamin. C rich foods ($\bar{x} = 3.02$) and green leafy vegetables like pechay, malunggay, etc. ($\bar{x} = 2.84$).

It is well known that "the usefulness of vitamin can reduce the severity and length of a cold "(Heigh, [11]).It has also been mentioned by Neverman [16] that vitamin C helps kill viruses and strengthens body's immunity, thus preventing the recurrence of colds. The fruit richest in vitamin C that is readily available in any backyard is guava. Aside from being cheap, it is fresh, not bombarded with pesticides and inorganic fertilizers, the most – it contains 188 mg/ 0.5cup according to www.health.gov as cited by Neverman [16] . Children forget to notice this little fruit that helps boost their immune system. The same source also stated that one medium orange contains 70 mg of vitamin C. However, oranges are quite expensive than guavas so it is expected that most children consume less amount of it.

Table 3c presents the relationship between the experiences of climate – related illness in terms of pneumonia of the children to their health practices on food preparation, selection, and composition.

Table 3c
Correlation Matrix Showing the Relationship between the Experiences of Climate – related Illness in Terms of Pneumonia of the Children to their Health Practices

Pneumonia		Health Practices On Food Preparation, Selection, And Composition
	Experience	0.011
	Duration	0.026
	Frequency	0.026
	Jan	-0.136
	Feb	0.109
	Mar	-
	Apr	0.085
	May	-
	Jun	-0.088
months	July	-0.209*
	Aug	-0.088
	Sep	-0.088
	Oct	-
	Nov	-
	Dec	0.017

Legend:
* - Significant at 0.05 Level of Significance
** - Significant at 0.01 Level of Significance

Generally, the children's experience of pneumonia during the month July (r = -0.209) was brought about by their high level of practices on food preparation, selection, and composition. The relationship was found significant at 0.05 level. The negative sign of the correlation value depicts that the high level of practices on food preparation, selection, and composition of the children would spell to a lower incidence of suffering from pneumonia in July of children. Probably, nutrition played a great factor in decreasing the incidence of pneumonia in July. As what Caulfield *et al.,* [5] mentioned most deaths in young children are consequences of un– der nutrition.

6 CONCLUSION

Most children (3-6) in Bangued, Abra oftentimes follow the food preparation, selection, and composition practices. Majority of them experienced cough in less than 6 days and usually suffered from it during December. In terms of colds, many of these children experienced its recurrence once in a month. Pneumonia experience, on the other hand, affected only a very few number, but has the most incidence in February.

There is a significant positive relationship between cough experience to food preparation, selection, and composition practices. However, there is a significant negative relationship between the months of August in cough experience; frequency of colds experience; and of July in the usual month of pneumonia to the food preparation, selection, and composition practices.
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7 RECOMMENDATIONS

The results of this study recommend that the families in Bangued, Abra must be informed of this to remind them of how to help their young from being affected of the health impacts of climate change. A follow –up study must be made to determine more nutrition practices that could also help control the incidence of respiratory illnesses due to sudden change of weather in Bangued, Abra. Health workers must also vigilantly record these events to remain watchful of phenomenal health impacts that befall upon children. All tables and figures will be processed as images. You need to embed the images in the paper itself. Please don't send the images as separate files.
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