A Knowledge, Attitude and Practices Study of the Issues of Climate Change/Variability Impacts and Public Health in Trinidad and Tobago, and St Kitts and Nevis

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ABSTRACT

Objective: *To determine the level of understanding of the issues of climate change (CC)/variability (CV) and public health by populations of St Kitts and Nevis (SKN) and Trinidad and Tobago (T&T) and to find whether respondents would be willing to incorporate these values into strategies for dengue fever (DF) prevention.*

Design and Methods: *Using a cluster sampling system, representative samples of the communities of SKN (227) and T&T (650) were surveyed for responses to a questionnaire document with questions on the impact of climate variability on health, the physical environment, respondents' willingness to utilize climate issues to predict and adapt to climate variability for DF prevention. Data were analyzed by Epi Info.*

Results*: Sixty-two per cent SKN and 55% T&T of respondents showed some understanding of the concept of climate change (CC) and distinguished this from climate variability (CV). With regard to causes of CC, 48% SKN and 50% T&T attributed CC to all of: green houses gases, holes in the ozone layer, burning of vegetation and vehicular exhaust gases. However, some 39.3% SKN and 31% (T&T) did not answer this question.*

In response to ranking issues of life affected by CC/CV in both countries, respondents ranked them: health > water resources > agriculture > biodiversity > coastal degradation. The major health issues identified for SKN and T&T respondents were: food-borne diseases > water-borne diseases > heat stresses; vector-borne diseases were only ranked 4th and 5th for SKN and T&T respondents respectively. There was in both countries a significant proportion of respondents ($p < 0.001$) who reported wet season-related increase of DF cases as a CC/CV link. Respondents identified use of environmental sanitation (ES) at appropriate times as a method of choice of using CC/CV to prevent DF outbreaks. More than 82% in both countries saw the use of the CC/CV information for DF prevention by prediction and control as strategic but only 50–51% were inclined to become personally involved. Currently, only 50% SKN and 45% T&T respondents claimed current involvement in DF vector surveillance and control in the last two days.

Conclusion: *Despite the fact that knowledge and attitudes did not always coincide with practices of using ES for DF prevention, in both countries, even with CC/CV tools of prediction being available, it seems that respondents could be persuaded to use such strategies. There is a need for demonstration of the efficacy of CC/CV information and promotion of its usefulness for community involvement in DF and possibly other disease prevention.*

Un Estudio de Conocimientos, Actitudes y Prácticas (CAP) de los Problemas del Cambio Climático/Variabilidad de los Impactos y Salud Pública en Trinidad y Tobago y St Kitts Nevis

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RESUMEN

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Objetivo: *Determinar los niveles de comprensión de los problemas del cambio climático (CC)/ variabilidad (CV) y salud pública por parte de las poblaciones de St Kitts y Nevis (SKN) y Trinidad y Tobago (T&T), y averiguar si los encuestados estarían dispuestos a incorporar estos valores en las estrategias para la previsión de la fiebre del dengue (FD).*

Diseño y métodos: *Usando un sistema de muestreo por conglomerados, muestras representativas de las comunidades de SKN (227) y de T&T (650) fueron encuestadas mediante un cuestionario en el que se les pedía responder preguntas sobre el impacto de la variabilidad del clima sobre la salud, el ambiente físico, y la disposición de los encuestados a aprovechar las cuestiones del clima para predecir y adaptarse a la variabilidad climática a fin de prevenir la FD. Los datos fueron analizados mediante Epi Info.*

Resultados: *Sesenta y dos por ciento de los encuestados de SKN y el 55% de los de T&T, mostraron cierta comprensión del concepto de cambio climático (CC) y fueron capaces de diferenciarlo de la variabilidad climática (CV). En relación con las causas del CC, el 48% (SKN) y el 50% (T&T) atribuyó el CC a los gases de efecto invernadero, los agujeros en la capa de ozono, la quema de la vegetación, y los gases de escape de vehículos.*

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INTRODUCTION

The third assessment report of the Intergovernmental Panel on Climate Change (IPCC) indicated that Global climate change will have a wide range of negative health impacts (1). There is a considerable body of evidence of the health impacts of these anthropogenic climate changes (CC) – mainly through fossil fuel usage – resulting in these global changes in the health areas such as heat and cold stresses, increased vector-borne diseases, food- and water-borne diseases, emerging dust-borne respiratory diseases, and famine-related nutritional problems (2, 3). These health indicators have been more apparent in the more vulnerable countries with weaknesses in the health infrastructure as occurs in many developing countries (4). It is very likely that much of this new evidence will be presented in the 4th IPCC report which is in preparation.

More information is available on the issues of climate variability (CV) impacting on human health. Even so, how very gradual changes initiated by El Nino Southern Oscillation (ENSO) events on sea water surface temperatures – far away in the south Pacific – could impact on environmental issues such as biodiversity, health, water, agriculture and coastal degradation (1) in the Caribbean, may not be easily comprehended. But the evidence exists that global environmental temperatures have been increasing in the last 50 years (1), permitting significant observable changes in the environment. Models such as those by Githeko and Ndegwa (5) have been used to show how permissive climates in the normally cool highland environments of Kenya could become favourable to malaria outbreaks with unusually high temperatures. This could explain the geographical expansion of this disease in recent times. Focks *et al* (6) have postulated that dengue fever (DF) may have increased in prevalence and intensity due to small but critical increases in temperature, speeding up the life cycle of the vectors as well as replication of the viruses within the vector. This may explain the high DF endemicity that we have experienced in the southern Caribbean in the last 20 years (7). Two recent papers – Rawlins *et al* (8) and Amarkoon *et al* (9) have demonstrated the impact of climate on DF in the Caribbean region. Of course, other driving forces (10) – human and environmental – in addition to climate change features, may be partly responsible for these increased vulnerabilities.

What do the Caribbean people know about these apparent climate (-CC and CV-) impacts on the environment:

* The health issues
* The physical environment
* The people's understanding of the concept of climate change/variability
* The unprecedented increase in DF in the last 20 years and the cause of this occurrence
* The possibility of predicting periods (years) of higher risk of disease transmission
* Possible adaptation strategies to prevent significant outbreaks
* The attitudes of the population and their willingness to be part of this climate-based prevention programme?

With these questions in mind and with the support of the programme on the Assessment of Impacts of and Adaptation to Climate Change (AIACC), funded by the Global Environment Facility (GEF) and UNEP, this knowledge, attitude and practices (KAP) survey was launched in two Caribbean countries Trinidad and Tobago (T&T). T&T a large population with high levels of DF endemicity and St Kitts and Nevis (SKN) a small population with occasional DF. Perhaps this information emerging from this research on DF will stimulate an interest in researchers determining any adverse impacts of climate on other issues of health in the Caribbean and indeed other physical and environmental issues.

MATERIALS AND METHODS

A knowledge, attitude and practices questionnaire document was designed to elicit information from sectors of the

Caribbean people on climate issues. Questions were included on the following topics: demographics, understanding of the concepts of CC/CV, links of climate and the physical environment, links of climate and human health, attitudes to disease prevention using climate criteria and actual practices of disease prevention used by the community.

Two questionnaires were designed for each community. One asked general questions of the issues as above. The second questionnaire dealt with observations of actual mosquito larval survey and vector prevention strategies such as environmental sanitation (ES) practices used by householders in the community. Questions were also asked and observations made such as the number of potential vector habitats on the property, those in use, those which in the opinion of the householder were disposable and the frequency of inspection and ES efforts attempted. A group of interviewers were trained in administration of the questionnaire and in understanding the concepts of CC/CV. Thereafter, a pilot survey was conducted and final changes were made in the questionnaire before it was administered to the public.

The first questionnaire was administered to the general community group verbally, but at the same time, allowing the subject to read the question for better understanding. At the end of the questionnaire discussion, a vector inspector requested the householder's permission to examine the property for vector production and habitats. At this stage, the second questionnaire was completed. For the student group (from the same geographical areas) the questionnaire was self-administered. However, because the group was interviewed in the educational environment, no vector survey was possible and the second questionnaire was omitted.

Community clusters were selected for five areas of T&T representing urban and rural components: there were two communities in northern Trinidad – Maraval and Arima; there were two communities in southern/central Trinidad – Rio Claro and San Fernando. There was one community selected in Tobago in and around the city of Scarborough. For the student groups, a high school with a post-CXC population within each selected cluster was chosen. Two hundred questionnaires administration attempts were made in each of the general community areas and one hundred to each of the student groups. This gave an overall questionnaire attempt rate of 1/1000 (1500/1.5 million population).

In SKN, six community clusters around the island of St Kitts and one in Charlestown, Nevis, were chosen for the study. Students were selected from the Fitzroy Bryant Community College in St Kitts which is the training facility for all post-CXC students in the state. In all, two hundred general community and one hundred student community interviews were attempted. This gave an overall questionnaire attempt rate of 11/133 (300/40 000 population). Data from the surveys were entered and analyzed by EPI Info (version 6) and Statistical Package for the Social Sciences. Means were obtained and any statistical differences demonstrated by chi-square analysis.

RESULTS

There was a response rate of 43.3% (201 students and 449 in the general community) to the 1500 questionnaires administered to (500 students and 1000 from the general community) administered in the five selected areas of T&T. In SKN, there was a much higher response rate of 75.6% – 51 of the 100 students and 176 of the 200 general community. Overall, there were 227 questionaire completed in SKN and 650 in T&T.

Of the 227 SKN respondents, 58.1% were females, 37.9% males (4% unknown) while among the T&T respondents, there were 56.9% females, 40.6% males (1.5% unknowns). The SKN population were largely described as rural dwellers (63%), while 31% claimed to be urban. In T&T, the sample was 53% rural and 46% urban.

The largest single age component of the study groups for both countries was the 15–24-year age group (34.5%), while there was a fairly even balance of other age groups in both countries. Overall, age presentations in years were: 15–24 (34.5%) > 35–44 (16%) > 65 and older (12.8%) > 45–54 (12.7%) > 25–34 (12.2%) > 55– 64% (10.8%). Highest levels of educational attainment was secondary school education for both groups – 56.9%; SKN was 62.1% and T&T was 55.1%. The SKN group claimed a 22.5% tertiary education attainment while T&T was only 7.2%.

1. Understanding the concept of *"Climate Change":* over 62% of the SKN population and 54.8% of the T&T respondents appropriately answered that CC referred to increases in temperature and rainfall in the last few years, (Table 1). For this particular option, there was no significant difference between the answers from the two countries ($p = 0.107$), however, there were significant differences ($p = 0.026$) for the various answers to the options of Table 1. With regard to the concept of "climate variability", 76–78% of both country respondents identified correctly that the term referred to seasonal changes in both temperature and rainfall (Table 2).

Table 1: **Concept of climate change by country**

	Country			
	St Kitts & Nevis		Trinidad & Tobago	
Concept of climate change	**n**	**%**	**n**	**%**
Increase in temperature (Last few years)	48	21.1	204	31.4
Increase in temperature and precipitation (last few years)	142	62.6	356	54.8
None of the above	9	4.0	16	2.5
Don't know	16	7.0	46	7.1
No response	12	5.3	28	4.3

$\chi^2 = 9.3$; df = 3 $p = 0.026$

Table 2: Concept of climate variability

	Country			
	St Kitts & Nevis		Trinidad & Tobago	
Concept of climate variability	**n**	**%**	**n**	**%**
Seasonal changes in temperature	23	10.1	51	7.8
Seasonal changes in precipitation	9	4.0	33	5.1
Both of the above	177	78.0	497	75.6
Neither of the two	0	0.0	1	0.2
Other (unspecified)	0	0.0	2	0.4
Don't know	17	7.5	53	8.2
No response	1	0.4	13	2.0

$\chi^2 = 1.53$ df = 3 $p = 0.67$

2. In answer to questions on "causes of climate impacts", while small numbers of respondents referred to "greenhouse gases, holes in the ozone layer, burning of vegetation and vehicular exhaust fumes, the majority of respondents – 47.6% (SKN) and 50.2% (T&T), ($p > 0.05$) attributed climate impacts to all these factors (Table 3).

Table 3: Causes of climate impacts by country

	Country			
	St Kitts & Nevis		Trinidad & Tobago	
Causes of climate impacts	**n**	**%**	**n**	**%**
Green house gases	5	2.2	7	1.1
Holes in the ozone layer	6	2.6	42	6.5
Burning vegetation	4	1.8	58	8.9
Vehicular exhaust fumes	5	2.2	26	4.0
All of the above	107	47.6	326	50.2
None of the above	5	2.2	12	1.8
Other Causes (Unspecified)	4	1.6	3	0.5
Don't know	1	0.4	8	1.2
No response	89	39.2	200	30.8

$\chi^2 = 16.58$ df = 4 $p = 0.0023$

A sizeable proportion, 39.2% (SKN) and 30.8% (T&T), did not respond to this question. Overall, the differences in the answers from the SKN and the T&T populations were significantly different ($p = 0.0023$).

3. In answer to questions on which areas of our lives CC/CV were likely to affect humans, small proportions of respondents mentioned health, water resources, agriculture, biodiversity and coastal degradation singly, but in both countries, respondents selected all these issues combined – 54.6% (SKN) and 45.5% (T&T) – as areas that CC/CV affect us most (Table 4). When a ranking was given to these issues however, health > water > agriculture > biodiversity > coastal degradation was perceived as the major aspect of human affairs affected by CC/CV, in both countries. Overall, while communities in both countries were overwhelmingly aware of the adverse impacts of CC/CV on the communities, there was a significant difference ($p < 0.0021$) between the responses of the two countries' respondents.

Table 4: Areas in which CC/CV affect both countries

	Country			
	St Kitts & Nevis		Trinidad & Tobago	
Areas	**n**	**%**	**n**	**%**
Health	13	8.6	70	14.1
Water resources	8	5.3	58	11.7
Agriculture	3	2.0	43	8.7
Biodiversity	3	2.0	8	1.6
Coastal degradation	1	0.07	3	1.2
All of the above	83	54.6	226	45.5
None of the above	1	0.7	5	1.0
No response	43	23.8	141	28.2

$\chi^2 = 16.78$ df = 4 $p = 0.0021$

4. When asked to specify the health issues that were affected by CC/CV, most respondents did not answer the question – 56.6% (SKN) and 54.3% (T&T), (Table 5).

Table 5: Health issues affected by climate change and/or climate variability

	Country			
	St Kitts & Nevis		Trinidad & Tobago	
Areas	**n**	**%**	**n**	**%**
Food-borne diseases	11	7.2	89	17.9
Water-borne diseases	10	6.6	82	16.5
Vector-borne diseases	8	5.2	12	2.4
Respiratory diseases	14	9.2	19	3.8
Heat stresses	15	9.9	55	11.1
All of the above	0	0.0	2	0.4
None of the above	16	10.5	11	2.2
No response	86	56.6	270	54.3
Don't know	0	0.0	1	0.2

$\chi^2 = 47.89$ df = 5 $p = 0.0000$

For SKN respondents, heat stress at 9.9% was the most important issue, while for T&T persons, food-borne disease > water-borne disease > heat stress were the major issues of importance. Vector-borne diseases only ranked 4th and 5th for SKN and T&T respondents respectively.

5. Information sources on CC/CV and sharing: individual sources of information (SKN) ranged from the family < print media < peers < electronic media, while for T&T, this ranged from the family < peers < print media < electronic media (Table 6). Respondents who selected all these four criteria represented the single majority of the SKN (41.3%), and the T&T (26.4%) samples. These differed significantly ($p < 0.04$; chi-square = 4.18). There were overall significant differences in the responses of the two country groups (chi-square = 55.64;

Table 6: Source of information on climate change/variability

	Country			
	St Kitts & Nevis		Trinidad & Tobago	
Source of Information	**n**	**%**	**n**	**%**
1. Peers	21	13.8	52	10.4
2. Family	1	0.7	24	4.8
3. Print media	5	3.3	101	20.3
4. Electronic media	24	15.8	176	34.2
5. All of the above	63	41.4	131	26.4
6. None of the above	36	23.7	82	16.5

$\chi^2 = 55.64$ df = 5 $p = 0.00000$

$p = 0.0000$). Sharing CC/CV information was done to family, peers and the community, but 56–57% of both country's respondents selected all three of these groups for information sharing.

6. The potential link between CC/CV and dengue fever (DF): there was a significantly greater proportion of respondents ($p < 0.001$) who reported increased number of cases in the wet season as a link between CC/CV and DF transmission (Table 7). The 54.8% of SKN and the

Table 7: Perceived links between climate change/variatibility and dengue fever

	Country			
	St Kitts & Nevis		Trinidad & Tobago	
Perceived links	**n**	**%**	**n**	**%**
Increased case year round	11	6.6	34	7.8
Wet season	91	54.8	271	62.4
Increased cases in dry season	0	0	4	0.9
All of the above	48	28.7	106	24.4
None of the above	4	2.4	7	1.6
Don't know	13	7.8	12	2.8

$\chi^2 = 7.83$ df =4 $p = 0.098$

62.4% of T&T respondents selected this option over increased number of cases year round or in the dry season. Respondents did however identify increased breeding habitats over increased temperature-related issues of speeding up the vector life cycle and virus replication in the mosquito host (Table 8). Indeed, the option of all these features were selected by 43% of the SKN and 28% of the T&T respondents. These two differed significantly, ($p < 0.001$, chi-square = 5.63). Overall, the answers for the SKN and the T&T respondents were highly significantly different ($p = 0.00019$).

7. Best ways to reduce the DF transmission using CC/CV information: source reduction of habitats for DF (vector) limitation was selected by both SKN (60.3%) and T&T (70.2%) ($p = 0.006$; chi-square = 7.38). Other methods such as pesticide usage or use of biological tools as well as leaving the efforts to the public health authorities were of lesser selection (Table 9).

Table 8: Perceived effect of climate change/variability on DF virus

	Country			
	St Kitts & Nevis		Trinidad & Tobago	
Perceived effect	**n**	**%**	**n**	**%**
Increased breeding in containers	89	39.1	378	58.2
Warm temperature speeding up life cycle	3	1.3	19	2.9
Increased virus replication	2	0.9	4	0.6
All of the above	97	42.9	184	28.3
None of the above	16	7.0	26	4.0
Don't know	20	8.8	39	6.0

$\chi^2 = 29.4$ df =5 $p = 0.000019$

Table 9: Best ways to reduce virus transmission using CC/CV information

	Country			
	St Kitts & Nevis		Trinidad & Tobago	
Best ways	**n**	**%**	**n**	**%**
Reducing the number of habitats	137	60.3	459	70.7
Pesticide usage at CC/CV	27	11.9	116	17.9
Use of biological control tools	16	7.1	29	4.5
Others	22	9.6	61	9.4
Don't know	31	13.7	57	8.8

$\chi^2 = 11.84$ df = 4 $p = 0.000019$

8. Using CC/CV information for DF prevention was seen as a positive move by 82% of both populations. However, of both country's respondents, 18–20% did not know whether they were prepared to educate themselves on the CC/DF links and had a willingness to work for environmental sanitation (ES) all the time for vector mitigation. Indeed, 51–52% of these two country's respondents listed an inclination to be practically and positively involved with all these issues (Table 10).
9. On a general issue, 91% (SKN) and 93% (T&T) respondents favoured making a national health priority of using CC/CV information such as prediction and enhancing ES strategies at times of higher risk of transmission of DF if the link between DF and CC could be established and demonstrated. However, on a practical issue, only 49.7% (SKN) and 45.1% of (T&T) respondents claimed a current practical involvement in ES *vs* DF in the last two days, and only 17% and 30% respectively were personally actively working in ES for DF prevention in the last week (Table 11).
10. Inspection of wet containers indicated that there was still a significant amount of vector breeding in the residences

Table 10: Suggested strategies for dengue prevention

	Country			
	St Kitts & Nevis		Trinidad & Tobago	
Strategies	**n**	**%**	**n**	**%**
Self educated about disease/CC link	17	7.4	51	7.9
Community knowledge about how to break transmission	23	8.0	58	9.0
Community involvement in environmental sanitation	3	1.3	11	1.7
Willingness of community to work for environmental sanitation	11	4.8	65	10.0
All of the above	119	52.4	454	51.5
Don't know	46	20.3	119	18.3
None of the above	15	6.6	29	4.5

$\chi^2 = 9.06$ df = 5 $p = .1065$

Table 11: Most recent involvement in environmental sanitation

	Country			
	St Kitts & Nevis		Trinidad & Tobago	
Strategies	**n**	**%**	**n**	**%**
Two days ago	80	49.7	211	45.1
One week ago	7	16.8	140	29.9
One month ago	26	16.1	73	15.6
Last year	15	9.3	3	2.3

$\chi^2 = 39.72$ df = 3 $p = 0.000$

of both groups of respondents. In the barrel/drum category, there was a 39% and a 12% *Aedes aegypti* positive rate in the SKN and T&T populations.

DISCUSSION

Apart from the initial definition differences of CC and CV in this study, climate impacts whether due to long term anthropogenic (mainly fossil fuel use -CC) or seasonal or ENSO-related impacts (CV), the terms, climate impacts or CC/CV were used interchangeably. There has not been any significant discourse on climate and health issues in the Caribbean, though there have been discussions on climate and environmental issues such as coastal degradation. Worldwide, the impact of CC/CV on health issues has taken a relatively lower profile than environmental issues (2), and for each paper of evidence of CC/CV impacting on some diseases, *eg* malaria in the Kenyan highlands (5), there have been others challenging the veracity of this (11–12). Obviously, there is a need for climate-based impacts on health issues to be carefully examined and evaluated, then presented to the community for their action in preventing disease.

Here in the Caribbean, we have already started to gather climate/health issues evidence. Rawlins *et al* (8) and Amar-koon *et al* (9) have recently presented evidence of CC/CV impacting on DF transmission in the Caribbean region. As far as respiratory diseases are concerned, evidence has come from Barbados and T&T on Sahara dust – thought to be re-lated to global warming on the African continent – impact-ing on asthma in children (13, 14). Thus, it is reasonable to ask how informed are the general Caribbean public about climate/health issues and to enquire whether this information would be acceptable as a stimulus to enhance disease preven-tion strategies.

The sample population of SKN and T&T did show a considerable knowledge of the nature and of causes of CC/CV (Tables 1, 2). However, the 31–39% who did not answer the question makes one wonder whether this was due to ignorance and therefore signalled the need for an educational campaign on the subject. The expectation in this survey was to find a significant difference in the improved climate-based knowledge in secondary and tertiary students over the rest of the community, but there was no apparent difference.

Data from two Caribbean countries on the awareness of CC/CV presented a mixed picture. All mentioned that the impact of CC/CV affected water resources, health, agriculture, biodiversity and coastal degradation. Health and water were singled out as the most important issues affected by CC/CV. The alarming issue from this survey was that when asked to specify the health issues affected, 54–57% of the respondents did not respond; it was not possible to say whether this was due to ignorance. For this specific survey, CC/CV impacts on vector-borne diseases was only ranked 4th and 5th by the SKN and the T&T respondents respectively.

The electronic media (radio and television) as well as peers were the main source of choice, while the print media and family interaction were not so important to respondents of both countries. For dissemination of CC/CV information in a health promotion programme, TV and radio will prove strategic because of widespread and easy usage especially by groups such as adolescents and young adults.

The perceived link between climate and DF is significant. The responses indicated that most respondents really referred to seasonal (wet season, CV) changes rather than real CC – long term temperature changes. In both countries, little practical attention was paid to temperature change features such as speeding up of the lifecycle of the vector or virus replication within the invertebrate host (6). But there was reference to increased precipitation (and larval habitats) and correlation to increased DF cases really referred to our annual (seasonal) DF phenomenon (8). It seems though that health education messages in the region in the last 10 years of promoting source reduction as a means of reduction of vector (*Ae aegypti*) abundance has had some success at least intellectually if not practically. Some 60–70% of respondents were aware of this method, though these numbers should improve further.

Even better was the opinion of 82% of both set of respondents of the potential utility of CC/CV information for adaptation for DF prevention. However, only 51 – 52% of these two countries' respondents showed an inclination to be positively and practically involved in these DF prevention issues.

Even more, when 91–93% of respondents opined on making a national priority of CC/CV information and seeing this as a useful tool for DF risk prediction and disease prevention, this proved to be theoretically excellent. However, there was less than 50% who were currently seriously involved (inspection and control within the last two days), for practical comparison. The drum/barrel *Ae aegypti* indices on inspection for SKN was 38.9% and for T&T, 12.3%. While this is not necessarily the best vector production indicator, it shows that a high proportion who currently opined that source reduction and environmental sanitation was the right way for DF prevention, were still producing *Aedes aegypti* on their premises and their opinions on ES was only a mental issue which had not yet moved forward into essential practices.

In summary the present study shows that respondents from two Caribbean countries' demonstrated good knowledge and attitudes to CC/CV and use of this information for adaptation for DF prevention. However, the issue of practical use of such knowledge has not been put into practice. This may be because no effort has been made to assure the region's communities that CC/CV is an important risk factor for enhanced DF transmission and that adaptation – taking special precautions at times of predicted high risk – could be a valuable additional tool to prevent disease transmission.

The future burden of the scientific community for use of CC/CV information and DF mitigation remains to:

- demonstrate clearly to the public, the links between climate and DF. It is possible to make a case of risk predictability and apply this for vector and disease mitigation;
- promote CC/CV information, using alliances of health education for best community involvement and possible positive responses,
- stimulate research on CC/CV and other public health issues and
- promote cross-disciplinary initiatives and studies for CC/CV and the environment.

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