The COVID-19 pandemic is having far-reaching impacts on how people earn a living and meet critical needs. The Caribbean COVID-19 Food Security and Livelihoods Impact Survey was launched by CARICOM to rapidly gather data on impacts to livelihoods, food security and access to markets.

Two rounds of the survey have been carried out, implemented by the World Food Programme on behalf of the CARICOM Secretariat. This summary analyses data collected in the second round, carried out over the last two weeks of June 2020, which received 5,707 responses from 23 countries and territories in the Caribbean. It builds on findings from the first survey implemented in April 2020, which received 4,537 responses from 19 countries and territories.

The survey was conducted using online methods and the survey link was shared via social media, e-mail, and text messages. In Curaçao, almost one third of the population is not using the internet, and it is assumed that the poorest, most vulnerable and rural households are underrepresented in the survey results.
COVID-19 and measures to contain it have resulted in widespread disruptions to livelihoods. Two out of five respondents reported that their ability to carry out livelihoods was impacted, mainly owing to movement restrictions or concerns about leaving the house.

Nearly all respondents (93%) predict that their livelihoods will be impacted in the future, while almost every fifth respondent expects this impact to be severe. Four out of five respondents expressed negative or very negative sentiment concerning the pandemic and the disruption it caused.

The pandemic appears to affect the economic wellbeing of the vast majority of households in Curaçao. Almost two thirds of respondents have experienced job loss or reduced incomes in their households, in line with regional trends, and for nearly the same proportion of respondents, unemployment is the main worry, followed by illness.

COVID-19 and measures to contain it have impacted the availability of goods and market access, but to a lesser extent than in the region. One out of ten respondents experienced difficulties in accessing markets, mainly due to movement restrictions, and for a quarter of respondents essential medicines were only partially available.

The majority of respondents observed an increase in food prices (85%) and changed their shopping behaviour (77%) since the pandemic began. Most respondents who changed their shopping patterns resorted to buying cheaper and less preferred brands (47%) or larger quantities than usual (43%).

Food insecurity has also been a concern in Curaçao, but impacts appear less widespread when compared to the region. In June, almost two thirds of respondents replied that they had no difficulties eating enough in the week prior to the survey. At the same time, a tenth of respondents reported not having any food stocks at home and resorted to skipping meals or eating less than usual.

Respondents were asked how they feel their household’s income compares to the rest of the country. Of all respondents, 47% assessed their income as above or well above average, while only 19% assessed it as below or well below average. This finding and the fact that almost one third of Curaçao’s population does not use the internet means that the results of this web-based survey should be read with some caution, as they may be biased towards higher-income households.
Age and sex breakdown of respondents

Age and gender breakdown reveals that respondents were much more likely to be female than male and the largest proportion of respondents were concentrated in the 41-60 age category.

The overall number of respondents in Curaçao is insufficient to enable an age, sex or income disaggregated analysis.

Sex of respondents

- Female: 64%
- Male: 36%

Age of respondents

- 25 and under: 7%
- 26 - 40: 28%
- 41 - 60: 19%
- Over 60: 7%

Perceived income level

Respondents were asked how they feel their household's income compares to the rest of the country. Of all respondents, 19% assessed their income as below or well below average, while 35% assessed it as average, and 47% as above or well above average.

- Well below average: 12
- Below average: 20
- Average: 59
- Above average: 53
- Well above average: 27

“As a consultant and entrepreneur I lost all leads. But then got a fulltime job at a university. I am mainly very very worried about others who didn't manage to find a job, how are they going to pay for their expenses, their food and what is going to happen to their mental health and our society on Curaçao?” - Female, Age 26
**Main household income sources**

Respondents were asked to indicate the main income source/s for their household and multiple choices could be selected. The main income source is salaried work, with 73% of respondents, followed by business/trade (30%).

In the Caribbean, a trend has been observed in changes in income sources as a reflection of the negative impact that COVID-19 has had on labor markets in the region. This includes a loss of more formal sources of income and higher reliance on external support, such as remittances from abroad, family and friends, or government assistance, as respondents try to find other means of covering expenditure shortfalls.

While the reliance on income from salaried work is similar when compared to the region, respondents from Curaçao were more likely to rely on income from own business or trade. At the same time, they were less likely to rely on support from family and friends.
Disruptions from COVID-19 have had a negative effect on market access. In June, 12% of respondents indicated they had problems accessing markets in the past week, a smaller share than in the whole region (27%). Movement restrictions were the primary reason, cited by nearly half of respondents experiencing lack of access to markets, followed by concerns about leaving the house (29%). A lack of cash to spend (19%) was cited by a smaller share of respondents than in the region (38%), which may be due to more respondents coming from higher income households.

For those who faced a time when they could not access markets in the past 7 days, the main reasons were...
Multiple responses could be selected

- Movement restrictions: 48%
- Concerns about leaving the house due to the outbreak: 29%
- Security concerns: 29%
- Transport limitations: 24%
- Markets/Grocery stores were closed: 19%
- Lack of cash to spend: 19%
- Household members are unwell: 10%
- Household members are quarantining: 10%

For example:
- “Costs of living (groceries) are absurd!” - Female, Age 50
- “Luxury items are being skipped.” - Male, Age 42

12% of households reported not being able to access markets in the past week, mainly due to movement restrictions.
### IMPACT ON MARKETS

#### Availability of items in stores

Respondents reported on the availability of key items in stores.

<table>
<thead>
<tr>
<th>How Available?</th>
<th>Fresh food items</th>
<th>Basic food items</th>
<th>Hygiene items</th>
<th>Essential medicines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Curacao Region</td>
<td>Curacao Region</td>
<td>Curacao Region</td>
<td>Curacao Region</td>
</tr>
<tr>
<td>Always Available</td>
<td>81%</td>
<td>71%</td>
<td>92%</td>
<td>83%</td>
</tr>
<tr>
<td></td>
<td>88%</td>
<td>85%</td>
<td>65%</td>
<td>55%</td>
</tr>
<tr>
<td>Partially/ sometimes available</td>
<td>18%</td>
<td>25%</td>
<td>6%</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>11%</td>
<td>13%</td>
<td>24%</td>
<td>30%</td>
</tr>
<tr>
<td>Not available</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>Don't know</td>
<td>1%</td>
<td>4%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>1%</td>
<td>2%</td>
<td>1%</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15%</td>
</tr>
</tbody>
</table>

Availability of goods has also been impacted, with similar trends as in the region. The availability of basic food and hygiene items was fairly high, reported to be always available by 9 out of 10 respondents. However, essential medicines were only partially available for every fourth respondent and fresh foods for one out of five respondents.

#### Food prices

Respondents reported on any observed changes in food price. The vast majority observed an increase.

![Food prices chart]

85% of respondents reported that food prices have increased. 78% of respondents reported food prices have decreased.
**IMPACT ON MARKETS**

**Shopping behavior**

Respondents were asked if they had to, and if so, how they altered their shopping behavior since the beginning of the pandemic. People are changing the way they shop, with shopping routines having changed for 77% of respondents. Buying cheaper or less preferred brands is the most common behaviour change, reported by 47% of respondents who changed their shopping patterns, followed by purchasing larger quantities than usual (43%). Respondents were less likely to buy smaller quantities than usual (19%) when compared to the region (30%).

% of respondents that changed their shopping behavior

- 77% Yes
- 86% No

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**How respondents changed their shopping behaviour**

Multiple responses could be selected

- Buying cheaper or less preferred brands: 47%
- Buying larger quantities than usual: 43%
- Going to different stores: 26%
- Buying smaller quantities than usual: 19%
- Started or increased online ordering or delivery services: 17%

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“Even during the COVID 19 lockdown I needed to work, and compensate for the people who could not work/remained at home. The effects of the COVID 19 crisis are still playing out and likely my salary/additional benefits will be affected.” - Female, Age 31

“We lost or our income and are using our savings to cover cost.” - Male, Age 39
The COVID-19 pandemic and measures to stop its spread have impacted household food security but impacts appear less widespread when compared to the region. Almost three out of ten respondents said that they had over one week of food supply stored up, but every tenth respondent had no food stocks at all in their household. Two thirds of respondents reported having no difficulty consuming enough food during the week prior to the survey in June, compared to 44% in the region. Every tenth respondent skipped meals or ate less than usual, a smaller share than in the region (27%).

**Food stocks**

Respondents were asked to indicate the amount of available food stock for their household.

<table>
<thead>
<tr>
<th></th>
<th>Curacao</th>
<th>Regional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does your household have any food stock?</td>
<td>11%</td>
<td>13%</td>
</tr>
<tr>
<td>No</td>
<td>59%</td>
<td>54%</td>
</tr>
<tr>
<td>Yes. Less than 1 week</td>
<td>31%</td>
<td>33%</td>
</tr>
<tr>
<td>Yes. More than 1 week</td>
<td>5%</td>
<td>21%</td>
</tr>
</tbody>
</table>

**“Unable to find vegetables or increased prices makes you change what you eat.” - Female, Age 37**

**“Food became more expensive.” - Male, Age 62**

**Food consumption**

Respondents were asked to reflect on their food consumption during the week prior to the survey.

**Which statement best reflects your food situation over the past 7 days?**

- I went one whole day without eating: 5% (Curacao), 5% (Regional)
- I skipped meals or ate less than usual: 12% (Curacao), 27% (Regional)
- I ate less preferred foods: 15% (Curacao), 21% (Regional)
- I had no difficulties eating enough (normal pattern): 66% (Curacao), 44% (Regional)
- I increased my food intake: 2% (Curacao), 5% (Regional)
COVID-19 and measures to contain the virus have had a widespread impact on livelihoods. In Curaçao, two out of five respondents reported disruptions to their livelihoods. Similar to the region, movement restrictions were the primary reason, cited by 51% of affected respondents, followed by concerns about leaving the house (27%), a reduced demand for goods/services (19%) and transport limitations (18%).

Disruptions to livelihoods

Respondents reported on any disruptions to their livelihoods.

“Moved away from my university to spend quarantine at home, which also meant moving away from my job and losing my income.” - Male, Age 24

“As a result of lockdown and movement restrictions I had to switch to doing business more in-tensively online.” - Male, Age 62

For those that reported livelihood disruptions, the main reasons were...

Multiple choices could be selected

- Movement restrictions: 40% (51%)
- Concerns leaving the house: 33% (27%)
- Reduced demand for goods/services: 21% (19%)
- Transport limitations: 18% (16%)
- Livelihood inputs are too expensive: 21% (15%)
- No market to sell products: 8% (8%)
- Livelihood inputs are unavailable: 11% (5%)
- Increased demand for goods/services: 8% (4%)
- Adult members of the household are unwell: 3% (1%)

“ Moved away from my university to spend quarantine at home, which also meant moving away from my job and losing my income.” - Male, Age 24

“As a result of lockdown and movement restrictions I had to switch to doing business more in-tensively online.” - Male, Age 62
**IMPACT ON LIVELIHOODS**

**Income changes**

Respondents communicated changes to their household's income since the COVID-19 outbreak. The pandemic appears to be taking a widespread toll on households’ economic wellbeing. Similar to the region, almost two out of three respondents have experienced job loss or reduced incomes in their households.

Has your household income changed since the COVID-19 outbreak?

- **Loss of jobs or reduced salaries**: 63%
- **Had to resort to secondary or alternative activities to maintain income**: 5%
- **No change**: 31%
- **Increased employment or revenues**: 2%

63% of respondents reported a loss in employment of reduction in salaries in June.

**Future livelihood impacts**

Respondents were asked to look ahead and predict the level of impact to their livelihoods as a result of disruptions from COVID-19. Almost all respondents believed that their livelihoods would be impacted to some degree, and nearly a fifth of respondents anticipate severe impacts.

How do you expect your livelihood will be impacted as a result of disruptions from COVID-19?

- **Curacao**:
  - Severe impact: 18%
  - Moderate impact: 20%
  - Little or no impact: 30%
  - Some impact: 25%

- **Regional**:
  - Severe impact: 24%
  - Moderate impact: 24%
  - Little or no impact: 24%
  - Some impact: 21%
**IMPACT ON LIVELIHOODS**

**Households engaged in farming/fishing**

Agriculture (including fishing) accounts for only 0.7% of national GDP in Curaçao, while food is a major import commodity. In this survey, only 11% of respondents reported being involved in food/livestock production and 4% in fishing, mainly for own consumption.

At the regional level, metrics of wellbeing for farming households do not differ much from the average respondents but households engaged in fishing seem to have been more adversely affected by disruptions related to COVID-19 as they report above average values for loss of jobs/reduced salary, difficulties in eating enough food, worrying about food needs and expecting their livelihood to be severely affected.

A disaggregated analysis of the impact of COVID on households engaged in farming or fishing in Curaçao cannot be conducted given the insufficient number of responses received from these subgroups. CARICOM and the United Nations Food and Agriculture Organization (FAO) are conducting a more in-depth assessment and analysis of the impacts of COVID-19 on agricultural livelihoods, production and food systems. More information about how the COVID-19 pandemic has impacted Caribbean small-scale fisheries and what solutions and adaptation methods are being used to ensure the continuity of livelihoods has been shared through resources and a regional webinar.

### Households engaging in farming/fishing

- **Food production/livestock raising**
  - No: 89%
  - Yes, for consumption: 9%
  - Yes, for sale: 0%
  - Yes, for both sale and consumption: 2%

- **Fishing/coastal activities**
  - No: 86%
  - Yes, for consumption: 9%
  - Yes, for sale: 0%
  - Yes, for both sale and consumption: 2%

### Worries

Almost two thirds of all respondents (60%) are mainly worried about unemployment, and half of respondents cite concerns about illness. At the same time, respondents in Curaçao are much less likely to worry about their inability to cover food and other essential needs compared to the region.

#### What are you mainly worried or concerned about at the moment...

Multiple responses could be selected:

- **Unemployment**: 60%
- **Illness**: 53%
- **Inability to cover essential needs**: 25%
- **Having to resort to savings**: 38%
- **Social isolation**: 22%
- **Movement restrictions**: 17%
- **Inability to cover food needs**: 18%
- **Disruptions to education**: 12%
- **Child(ren)/dependent care**: 9%
- **Unable to access services**: 11%
- **Violence in the household**: 6%
- **Violence in the community**: 4%

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Unpaid care and work

The COVID-19 pandemic has impacted the amount of time people are spending on unpaid activities.

The majority of respondents (55%) reduced time spent for shopping while time devoted to domestic work and subsistence activities has increased among many. There was no major difference on time spent on childcare, unlike the region as a whole, where an increase was dominant.

<table>
<thead>
<tr>
<th></th>
<th>Domestic work</th>
<th>Childcare</th>
<th>Shopping</th>
<th>Subsistence production</th>
<th>Community work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased</td>
<td>7%</td>
<td>4%</td>
<td>55%</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td>No change</td>
<td>45%</td>
<td>46%</td>
<td>27%</td>
<td>47%</td>
<td>54%</td>
</tr>
<tr>
<td>Increased</td>
<td>45%</td>
<td>18%</td>
<td>17%</td>
<td>34%</td>
<td>15%</td>
</tr>
<tr>
<td>Not applicable</td>
<td>3%</td>
<td>31%</td>
<td>1%</td>
<td>10%</td>
<td>20%</td>
</tr>
</tbody>
</table>

“Mostly by the lack of tourism. Not directly, as I don’t work in tourism, but the whole island is affected by it.” - Male, Age 27

“Just finished school and I am concerned that I can’t find a job. Also some people are angry with the loss of jobs and are rioting.” - Female, Age 21

“We are very lucky to have stable income and our health. We have only very slightly been affected.” - Female, Age 29

“Loss of income. I had to close down my business and now thinking about relocating to Europe, mainly Amsterdam.” - Female, Age 37
How people are coping and adapting

The survey gave respondents space to give fuller and more nuanced insights on how they are coping and adapting to the disruptions caused by COVID-19. In June, 42, or 25%, of the 171 respondents from Curaçao answered the open-ended question. Text analysis was used to categorize and interpret the degree of positive and negative emotions within the responses using machine learning.

At the regional level, sentiments seem to have significantly deteriorated compared to April with ‘very negative’ comments increasing from 3% to 35%. Findings for Curaçao are similar, with 43% expressing ‘negative’ and the same share expressing ‘very negative’ sentiment.

Concerns regarding employment and growing financial strain on households have likely driven the increase in negative sentiments

"I am disabled and all my medical treatments were canceled so now in lots of pain and need to start over with rehab and need an extra operation" - Female, Age 55

"Social insecurity and injustice has led to violence in the community" - Female, Age 54

"Violence has increased too. Not in my community YET! But Corona has been a huge factor for this.” - Female, Age 25

"The measures implemented restricted visit to doctors. Waiting time of about 5 days to get an appointment." - Male, Age 50; rated Negative

"For me it was a time to reflect and read God's word and study it." - Female, Age 62

"Use less, live simple" - Female, Age 38
Key themes

The word cloud represent key themes on how people in Curaçao are being impacted and are adapting to disruptions from COVID-19. The most commonly mentioned phrase is “job”, alongside “lost” which indicates that a large focus of respondents are concerns about their ability to sustain their livelihood.

June 2020
CONCLUSION

Since March 2020, strict measures were put in place to reduce the spread of the coronavirus. The closure of borders, air and seaports has brought a halt to international tourism while internal movement restrictions and business closures have caused further economic disruptions.

Results from this survey suggest that the vast majority of people in Curaçao experience a deterioration of their employment and income situation, as well as an increase in food prices and concerns about the future of their livelihoods. A fifth of respondents expect their livelihood to be severely affected, and worries about unemployment and illness are widespread.

The pandemic is shifting life at home, with time spent on domestic work and subsistence activities increasing among many respondents, and shopping patterns changing towards cheaper goods and bulk purchases. While most consumer goods are widely available, limited access to essential medicines among a quarter if the population is concerning. One out of ten respondents in Curaçao experienced difficulties accessing markets, worried about the inability to cover food needs, had no food stocks in the house and skipped meals or ate less than usual.

Impacts on food security appear less widespread than in the region, which may be due to respondents coming largely from higher income households. With almost a third of the population of Curaçao not using the internet, the results of this web-based survey should be read with a degree of caution given potential bias towards households who can afford internet access or smartphone devices. More in-depth assessment and analysis on the wide-ranging economic and social impacts of COVID-19, particularly on the most vulnerable groups, will be critical to further inform responses to the unfolding crisis.

Considering the protracted nature of the crisis, the Government of Curaçao and its partners must redouble their efforts to mitigate the socioeconomic impacts through medium- and longer-term programmes and interventions.
### Income Changes

<table>
<thead>
<tr>
<th>Country</th>
<th>Has your household income changed since the COVID-19 outbreak?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aruba</td>
<td>81% ✓ 4% □ 13% □ 3% □</td>
</tr>
<tr>
<td>Saint Lucia</td>
<td>80% ✓ 4% □ 16% □</td>
</tr>
<tr>
<td>Sint Maarten</td>
<td>79% ✓ 3% □ 14% □ 3% □</td>
</tr>
<tr>
<td>Turks and Caicos</td>
<td>78% ✓ 4% □ 19% □</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>77% ✓ 8% □ 14% □ 1% □</td>
</tr>
<tr>
<td>Antigua and Barbuda</td>
<td>76% ✓ 7% □ 16% □</td>
</tr>
<tr>
<td>Belize</td>
<td>76% ✓ 9% □ 16% □</td>
</tr>
<tr>
<td>Jamaica</td>
<td>74% ✓ 8% □ 14% □ 1% □</td>
</tr>
<tr>
<td>Dominica</td>
<td>69% ✓ 10% □ 16% □ 21% □</td>
</tr>
<tr>
<td>Saint Kitts and Nevis</td>
<td>68% ✓ 3% □ 26% □ 3% □</td>
</tr>
<tr>
<td>Guyana</td>
<td>63% ✓ 11% □ 24% □ 2% □</td>
</tr>
<tr>
<td>Curacao</td>
<td>63% ✓ 5% □ 31% □ 2% □</td>
</tr>
<tr>
<td>Barbados</td>
<td>62% ✓ 5% □ 33% □ 1% □</td>
</tr>
<tr>
<td>Grenada</td>
<td>61% ✓ 8% □ 27% □ 4% □</td>
</tr>
<tr>
<td>Saint Vincent and the Grenadines</td>
<td>59% ✓ 11% □ 30% □</td>
</tr>
<tr>
<td>Cayman Islands</td>
<td>58% ✓ 2% □ 38% □ 2% □</td>
</tr>
<tr>
<td>Bermuda</td>
<td>49% ✓ 4% □ 45% □ 2% □</td>
</tr>
</tbody>
</table>

- Loss of jobs/reduced salaries
- Hard to resort to secondary income sources
- No change
- Increased employment

### Livelihood Disruptions

<table>
<thead>
<tr>
<th>Country</th>
<th>Was your ability to carry out livelihoods activities affected in the last 2 weeks?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guyana</td>
<td>65% ✓ 35% □</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>65% ✓ 35% □</td>
</tr>
<tr>
<td>Antigua and Barbuda</td>
<td>63% ✓ 37% □</td>
</tr>
<tr>
<td>Saint Lucia</td>
<td>61% ✓ 39% □</td>
</tr>
<tr>
<td>Turks and Caicos Islands</td>
<td>61% ✓ 39% □</td>
</tr>
<tr>
<td>Belize</td>
<td>61% ✓ 39% □</td>
</tr>
<tr>
<td>Jamaica</td>
<td>60% ✓ 40% □</td>
</tr>
<tr>
<td>Cayman Islands</td>
<td>56% ✓ 44% □</td>
</tr>
<tr>
<td>Grenada</td>
<td>55% ✓ 45% □</td>
</tr>
<tr>
<td>Dominica</td>
<td>53% ✓ 47% □</td>
</tr>
<tr>
<td>Saint Kitts and Nevis</td>
<td>52% ✓ 48% □</td>
</tr>
<tr>
<td>Sint Maarten</td>
<td>50% ✓ 50% □</td>
</tr>
<tr>
<td>Barbados</td>
<td>46% ✓ 54% □</td>
</tr>
<tr>
<td>Saint Vincent and the Grenadines</td>
<td>45% ✓ 55% □</td>
</tr>
<tr>
<td>Curacao</td>
<td>43% ✓ 57% □</td>
</tr>
<tr>
<td>Bermuda</td>
<td>43% ✓ 57% □</td>
</tr>
<tr>
<td>Aruba</td>
<td>42% ✓ 58% □</td>
</tr>
</tbody>
</table>


The second round of the CARICOM Caribbean COVID-19 Food Security and Livelihoods impact survey was launched via a webform, which was accessible on mobile/smartphone and PC/desktop. The data collection period was inclusive of 14 June to 1 July 2020. The survey was circulated via email, social media, SMS, media and other communication channels.

The World Food Programme (WFP) performed the data collection, monitoring and analysis. Responses were visualised live on an interactive dashboard and monitored to ensure their legitimacy based on cross referencing with prior knowledge and secondary data. Data validation methods were designed into the survey form to mitigate against intentional or unintentional outliers.

The qualitative analysis was performed in collaboration with Joseph Xu from Google’s AI unit using Natural Language Processing (NLP). NLP, a branch of AI which analyses and interprets human languages, provided: (a) a sentiment analysis to determine the number of positive versus negative responses and (b) auto-categorisation of responses. To moderate the non-representative nature of the data, the analysis team further refined the classifications presented by the algorithms.

WFP expresses warm appreciation to Flow and Digicel for distributing the survey link by SMS. Special thanks to the International Telecommunication Union for their support in facilitating the SMS distribution. Thanks to UNHCR for their support with the Spanish translation of the survey.

This report was prepared for WFP Caribbean by Kagin’s Consulting - Edward J. Taylor, Justin Kagin, Momir Blazek, Julian Fletcher-Taylor, Rebbeca Morton, Sebastian Fletcher-Taylor and Heng Zhu.