

Population movements estimated with mobile operator data from Digicel Haiti: report from 20 August.

Update: Data taken into account until Tuesday 17 August included.

Summary

The earthquake of Saturday 14 August 2021 has led to population displacement and significant changes in mobility. A redistribution of Digicel Haiti subscribers from the centre of Les Cayes and Camp Perrin to their periphery is observed. A similar phenomenon is taking place in Jeremie, although the centre of the city has seen an increase in traffic since Tuesday, August 17 (particularly in the southern part). These results may be caused partly by residents leaving and partly by visitors not coming into the city centre as much as before. Movements between Les Cayes and Jérémie were interrupted starting Sunday 15 August, and did not resume until Tuesday 17 August.

Additional results, maps and a graph are presented below. These results are preliminary and will be updated as soon as possible. The analyses can be adapted according to the information needs of the operational actors. Queries can be sent to info@flowminder.org.



Increase in traffic in localities

Very large increase (more than doubling) immediately north of Camp Perrin, south of Corail, and west of Asile through 17 August. Increased in the area between Cavaillon and St. Michel du Sud since 14 August, and more than doubled by 17 August.

Significant increase (up to a doubling) in a large area around Les Cayes (especially to the north and east to the outskirts of Aquin) and on the southwestern coast along the RD25 (especially at Coteaux and west of Les Anglais).



Decrease in traffic in localities

Sharp drop in the centre of Les Cayes, Camp Perrin and Aquin from 14 to 17 August.

Significant decrease in the centre of Jérémie on August 15 and 16 followed by a significant increase on 17 August (particularly in the south).

Moderate decrease along RD72 between Jérémie and Anse d'Hainault (west of the peninsula) on August 15 and 16, but normalised on 17 August.

Moderate decrease in the area between Bonne Fin and Baraderes (near the epicentre).



Mobility

Interruption of movements between Les Cayes and Jérémie from 15 August (not resumed on Tuesday 17 August).

Increase on the day of the earthquake of the median length of the routes traveled in the departments of the south, Grand'Anse and Nippes and strong decrease from Sunday 15 to Tuesday 17 included. Comparable results for Les Cayes and Jérémie.

Data Protection & Privacy

No personal data, such as an individual's identity, demographics, location, contacts or movements, is made available to the government or any other third party at any time. All results produced by Digicel Haiti and the Flowminder Foundation are aggregated results (for example, subscriber density in a given municipality), which means that they do not contain any information about individual subscribers. This data is fully anonymised.

This approach complies with the European Union's General Data Protection Regulation (EU GDPR 2016/679). Data is processed on a server installed behind Digicel Haiti's firewall, and no personal data leaves Digicel Haiti's premises.

Data

For billing purposes, mobile operators keep track of subscribers activity. These records are generated every time a subscriber makes or receives a call, sends or receives an SMS, or uses mobile data on their phone. They are called Call Detail Records (CDRs). CDRs contain information about the location of the cell tower that routes the call. These data can be analysed in near real time and provides insight into mobility patterns locally and across a country.

This report is based on the results of an analysis of CDR data provided by Digicel Haiti. CDRs are de-identified by Digicel Haiti and then analysed by Flowminder. Cell towers in close proximity are grouped together in clusters to limit the bias associated with call forwarding between nearby towers.

Limitations

These results were produced on the most active sample of Digicel Haiti subscribers in order to limit the biases associated with the large increase in telephone calls on the day of the earthquake. However, these preliminary results may be affected by the change in subscriber behaviour on the day of the earthquake. Redirection of calls to towers further away than those directly near some subscribers due to network saturation or technical damage may also have affected the results (this potentially applies to results north of Camp Perrin, the largest red dot on the 'Saturday 14 August' map). The spatial resolution of the results is finally limited by the size of the areas covered by the towers, which varies according to many parameters.

Daily Presence Maps

Definition

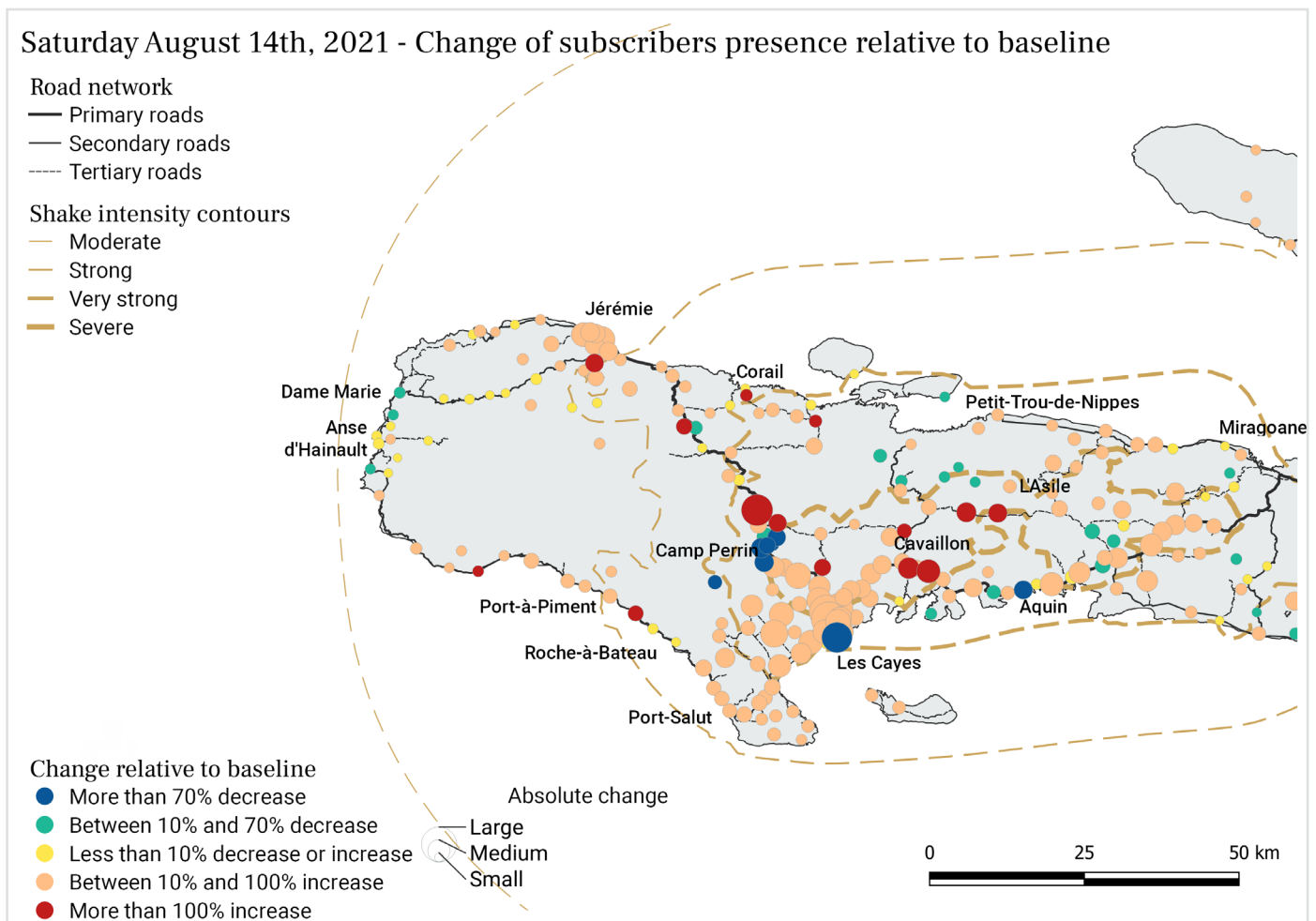
Presence is estimated by calculating the number of subscribers who made or received a call per cell tower cluster. The number of subscribers is expressed as a percentage deviation from the normal number (the median) for the reference period (10 June to 13 August 2021).

Reading the maps

Each coloured dot indicates a cluster of cell towers. The colour of the dot indicates whether there is an increase or decrease in the number of active subscribers compared to the baseline period. The diameter of the dot indicates the size of this difference in absolute number of subscribers (low, medium, high).

For example, on the map for Saturday 14 August, the blue dot in the centre of Les Cayes indicates that there was a drop in presence of more than 70% compared to normal, and the large diameter of the dot indicates that this represents a large number of subscribers. In contrast, the decline in the centre of Aquin was also very large compared to normal (blue colour: over 70% decline), but this represents a smaller number of subscribers (diameter of the dot: medium).

Finally, the beige lines indicate the felt intensity of the earthquake (source USGS), the black lines indicate the roads.



Sunday August 15th, 2021 - Change of subscribers presence relative to baseline

Road network

- Primary roads
- Secondary roads
- Tertiary roads

Shake intensity contours

- Moderate
- Strong
- Very strong
- Severe

Change relative to baseline

- More than 70% decrease
- Between 10% and 70% decrease
- Less than 10% decrease or increase
- Between 10% and 100% increase
- More than 100% increase

Absolute change

- Large
- Medium
- Small

0 25 50 km



Monday August 16th, 2021 - Change of subscribers presence relative to baseline

Road network

- Primary roads
- Secondary roads
- Tertiary roads

Shake intensity contours

- Moderate
- Strong
- Very strong
- Severe

Change relative to baseline

- More than 70% decrease
- Between 10% and 70% decrease
- Less than 10% decrease or increase
- Between 10% and 100% increase
- More than 100% increase

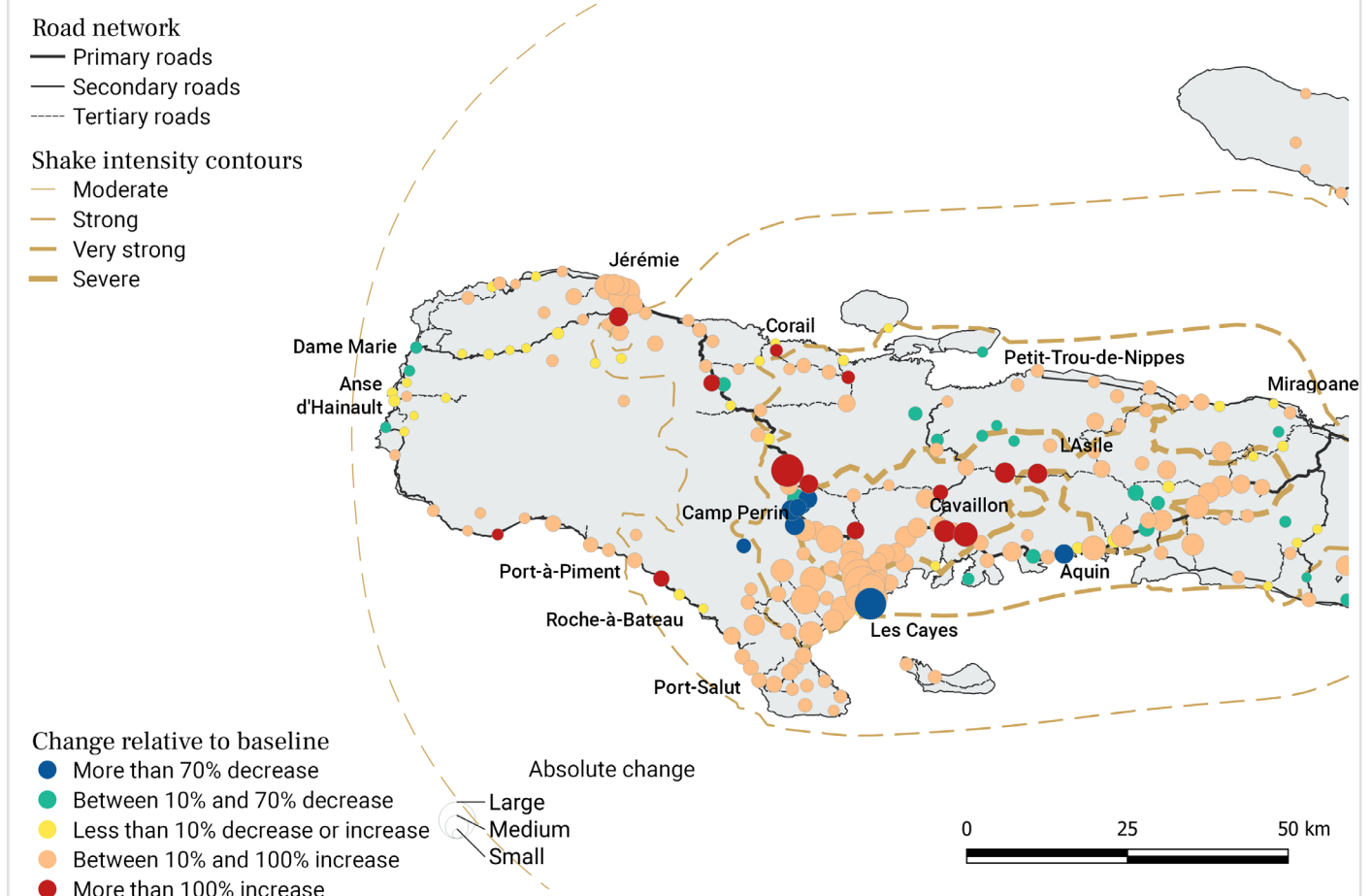
Absolute change

- Large
- Medium
- Small

0 25 50 km



Tuesday August 17th, 2021 - Change of subscribers presence relative to baseline



Box 1 | Calculation

The number of subscribers with at least one call per cell tower cluster is calculated for each day from 15 June to 17 August 2021. Only cell tower clusters with 15 or more subscribers are considered. The median value of this number is calculated per tower cluster for the period through 13 August (the day before the earthquake). This median is calculated for each day of the week separately (median values for Mondays, Tuesdays, etc). It is used as a benchmark for normal attendance. The number of subscribers observed each day from 14 August onwards is finally expressed in terms of percentage deviation from this median value, i.e. in terms of deviation from the normal.

Graph of the variation of the median length of the routes travelled

Définition

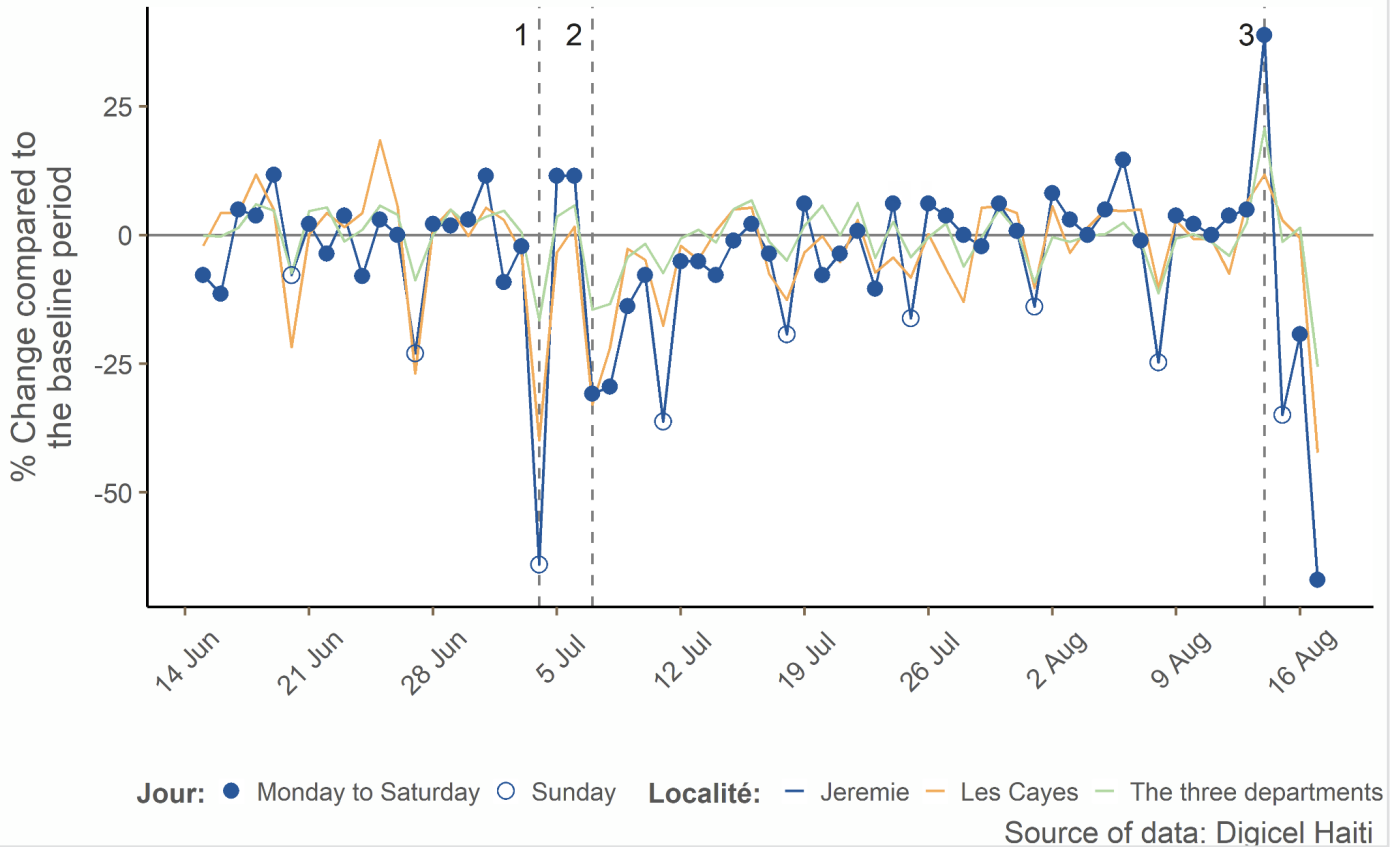
The median length of routes travelled by Digicel subscribers is expressed in terms of the percentage deviation from the normal value (the median) for the reference period (15 June to 13 August 2021). It is a mobility indicator: if roads are cut off or subscribers travel less (e.g. on Sundays), the value of this indicator drops. See Box 2 for more details.

Reading the graph

The horizontal axis represents the time. The vertical axis represents the deviation compared to the reference period: a value of 10% means an increase of 10% compared to the reference period. The blue line gives the results for Jérémie, the orange line for Les Cayes, the green line for the three most affected departments (Nippes, Sud and Grand'Anse). Finally, a blue (solid) disk indicates that the date corresponds to a Sunday, an empty blue circle to another day of the week. The vertical dotted lines indicate recent events that have impacted mobility (tropical storm Elsa, assassination of Jovenel Moïse and the earthquake).

Length of routes travelled

Key dates: (1) July 4: Tropical Storm Elsa (2) July 7: Assassination of Jovenel Moïse (3) August 14: Earthquake



Box 2 | Calculation

For each subscriber, the locations between successive calls are listed and form a set of routes - pairs of cell tower clusters between which a subscriber has moved between two calls. The length of each route is calculated as the distance as the crow flies between the tower clusters. For each 24-hour period, the median distance is computed over all the different routes travelled by a minimum of 15 subscribers, and is compared to the median distance of all the routes undertaken daily during the reference period.

Contact us

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