Internal Population Displacement in Haiti

Preliminary analyses of movement patterns of Digicel mobile phones: 1 January to 11 March 2010

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2. A Executive summary

We analyzed data from the locations of all Digicel mobile phones in Haiti before and after the earthquake. Our analyses cover the period 1 January to 11 March and include the movements of 2 million mobile phone SIM cards. We matched this data with census data and extrapolated the movement patterns to Haiti's population of 9.9 million persons.

Our results indicate that migration patterns of displaced persons are considerably different from what has previously been assumed, while the overall number of people displaced is similar to previous figures. Our estimates, projected from cell phone counts, suggest that on January 31st approximately 570,000 persons (22%) had left the Port-au-Prince metropolitan area. The three departments that received the largest absolute numbers of displaced persons were Sud, Ouest (the areas outside of the Port-au-Prince metropolitan area) and Artibonite.

The relative population increases in the departments outside Port-au-Prince were largest for Sud and Nippes (19 and 18% increases compared to pre-earthquake population levels), followed by Grande-Anse and Sud-Est (10% increase each). Since February the increasing population trend in the departments outside Port-au-Prince was reversed. On 11 March the population in the departments outside Port-au-Prince however still remained 3 to 12% above pre-earthquake levels.

After the initial large outflow, the population increased in Port-au-Prince from the end of January and during the rest of the analysis period. The population of Port-au-Prince is estimated to have been 15% smaller on 11 March than before the earthquake.

We estimate that the majority of people (68%) who moved into the Port-au-Prince metropolitan area during 1 February to 11 March lived in the Port-au-Prince area before the earthquake.

2 B Résumé

Nous avons analysé les données relatives à l'emplacement de tous les téléphones mobiles Digicel en Haïti avant et après le tremblement de terre. Nos analyses couvrent la période du 1er Janvier au 11 Mars et englobent les mouvements de 2 millions de cartes SIM de téléphone mobile. Nous avons mis en rapport ces données avec les données du recensement et ensuite, par extrapolation, nous avons défini les caractéristiques de déplacements de la population de Haïti estimée à 9,9 millions de personnes.

Nos résultats indiquent que les configurations des migrations des personnes déplacées sont très différentes des présomptions antérieures, tandis que le nombre total de personnes déplacées est similaire aux chiffres antérieurs. Nos estimations, déterminées à partir des chiffres de téléphones cellulaires, suggèrent qu'au 31 Janvier, environ 570 000 personnes (22%) avaient quitté la région métropolitaine de Port-au-Prince. Les trois départements qui avaient reçu le plus grand nombre de personnes déplacées, en termes absolus, ont été le Sud, l'Ouest (les zones en dehors de Port-au-Prince zone) et l'Artibonite.

Les augmentations relatives des populations dans les départements en dehors de Port-au-Prince ont été les plus importantes pour Sud et Nippes (19 et 18% d'augmentation par rapport à la population avant le séisme), suivis de la Grande-Anse et du Sud-Est (augmentation de 10% chacun). Depuis Février, la tendance de la croissance de la population dans les départements en dehors de Port-au-Prince a été inversée. Au 11 Mars, cependant, la population dans les départements en dehors de Port-au-Prince demeurait de 3 à 12% plus large rapport aux niveaux d'avant le séisme.

Après la sortie massive initiale, la population été en augmentation à Port-au-Prince depuis la fin du mois de Janvier et pendant le reste de la période d'analyse. Au 11 Mars, les estimations de la taille de population de Port-au-Prince ont indiqué que celle-ci est inférieure de 15% comparativement à sa taille avant le séisme.

Nous estimons que la majorité des gens (68%) qui se sont établis dans la région métropolitaine de Port-au-Prince entre le 01 Février et le 11 Mars vivaient dans la région de Port-au-Prince avant le tremblement de terre.

A. Introduction

Reports[1] described large population movements in Haiti following the Jan 2010 earthquake. The magnitude and trends of such population movements are important to efficient relief operations. In addition, such estimates provide essential information to design and interpret results of needs assessment surveys.

The Center for Disaster Medicine at Karolinska Institute in Sweden has in collaboration with Digicel Haiti analyzed data on movements of SIM cards from the Digicel Haiti mobile phone network in order to estimate migration patterns following the earthquake. The analyses cover the period from January 1st to March 11.

Section one of this report shows the estimated number of people who left the Port-au-Prince metropolitan area for the 10 departments of Haiti. Section two describes these changes over time and section three and four describe the return patterns and in-migration into Port-au-Prince after the earthquake.

B. Methods

The estimates are based on the movements of all Digicel SIM cards functioning both before and after the EQ. SIM cards registered after the EQ are thus not included in these analyses. The geographic locations of mobile phones (henceforward used interchangeably with the term “SIM card”) that we use in the analyses are the locations of the cell phone towers to which the phones connect when calling.

The analysis team had only access to anonymized data. The population estimates used derive from estimates for the year 2009.[2]

Two types of results are shown in this report, movements of phones and estimated movements of people. Approximately half (an estimated 55%) of all 15-59 year-old in Port-au-Prince own a Digicel SIM card and use it for regular phone calls. Outside Port-au-Prince, the figures are lower. To estimate movements of the whole population we have assumed that the movements of the Digiciel mobile phones can represent the movements of the whole population. To see if we could find evidence in the data indicating that this assumption was unwarranted, we examined how our estimates were affected by differences in movement patterns between the group with highest and lowest calling frequency (used as an indicator for socio-economic status). We also adjusted our population estimates for mobile phone density on both the level of the smallest administrative unit (communal section) and on the level of the Port-au-Prince metropolitan area. These different analyses did not indicate that there would be large biases produced

[1] OCHA. Haiti Earthquake - Population Movements out of Port-au-Prince - 17 February 2010. http://www.reliefweb.int/rw/rwb.nsf/db900sid/AMMF-82SVUA?OpenDocument&query=population%20movement&emid=EQ-2010-000009-HTI. Retrieved 11 May 2010.
OCHA. Haiti Earthquake - Population Movements out of Port-au-Prince - 8 February 2010. http://www.reliefweb.int/rw/rwb.nsf/db900sid/MNIN-82GQYS?OpenDocument&query=population%20movement&emid=EQ-2010-000009-HTI. Retrieved 11 May 2010.

[2] Population totale, population de 18 ans et plus menages et densités estimés en 2009. March 2009. Institut haïtien de statistique et d’informatique. http://www.ihsi.ht/produit_demo_soc.htm. Retrieved 11 May, 2010.

by the assumption above. For detailed information of these preliminary analyses, please contact the authors.

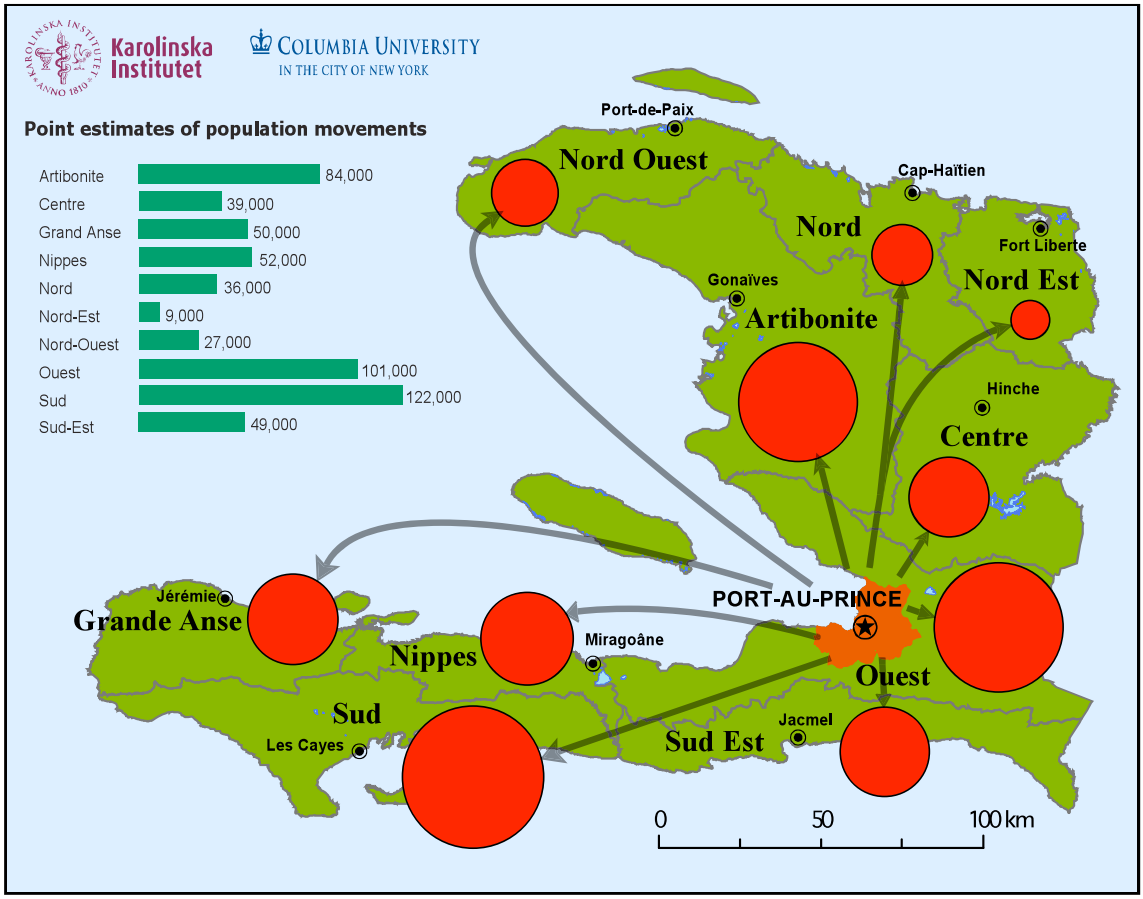
C. Caveats

We believe that the estimates in this report are the best currently available on population displacement in Haiti. This is however the first time this method is used for estimating population displacement patterns and the estimates have not been validated by other studies. If people without a mobile phone have very different population movement patterns compared to people with a mobile phone, the biases in our estimates could be very large. We welcome decision makers to contact the scientific team for discussions on specific estimates.

D. Results

1. About 570,000 person (22% of the population) had left Port-au-Prince by January 31st - The destinations of these persons were considerably different from previous assumptions

Map 1 below shows the estimated number of persons who on 31 January had relocated from Port-au-Prince metropolitan area to departments outside.



Map 1: Estimated number of persons who on 31 January had relocated from Port-au-Prince metropolitan area

Our point estimate of the overall number of people who left Port-au-Prince (570,000 persons) concurs with a previous OCHA estimate from 17 February (511,000 persons).[3] However the destinations of people displaced from Port-au-Prince are considerably different from what has been previously suggested. It has been assumed that Artibonite had received a third of all displaced persons (163,000 persons or 32% of all displaced) and that Artibonite together with Centre and Grand-Anse were the three top recipients of displaced people from Port-au-Prince. Furthermore the Sud region was assumed to be one of the regions that had received the fewest number of displaced persons from Port-au-Prince (25,000 persons).

In contrast, our results indicate that the largest numbers of displaced persons seem to have been received by Sud. The top three recipient departments in absolute numbers are,

3 OCHA. Haiti Earthquake - Population Movements out of Port-au-Prince - 17 February 2010. http://www.reliefweb.int/rw/rwb.nsf/db900sid/AMMF-82SVUA?OpenDocument&query=population%20movement&emid=EQ-2010-000009-HTI. Retrieved 11 May 2010.

in addition to Sud, also Ouest (outside of the Port-au-Prince metropolitan area) and Artibonite. Grande-Anse and Centre, previously believed to have received a large share of displaced persons, do not show a considerable divergence from the other departments.

The departments have different baseline population numbers. Changes relative to baseline levels is analyzed in section 2.

2. The population of Port-au-Prince decreased by approximately 22% but has since the end of January started to increase

Figure 1 below shows the estimated changes in the population of the Port-au-Prince metropolitan area from January 11 until March 11. These population estimates assume that migration patterns of mobile phones can be used to represent the migration patterns of the population as a whole (see caveats section for a discussion).

As an example of how to interpret the graph: on January 31st, the population of the Port-au-Prince metropolitan area was estimated to be 22% (570,000 people) lower than on January 11 before the earthquake.

Part of the increasing trend consists of phones that did not belong to Port-au-Prince before the earthquake. It could be that that these phones were carried largely by single individuals in search for work, rather than entire families. If that would be the case the upward slope could be less steep than suggested. Section 4 takes a closer look at this issue.

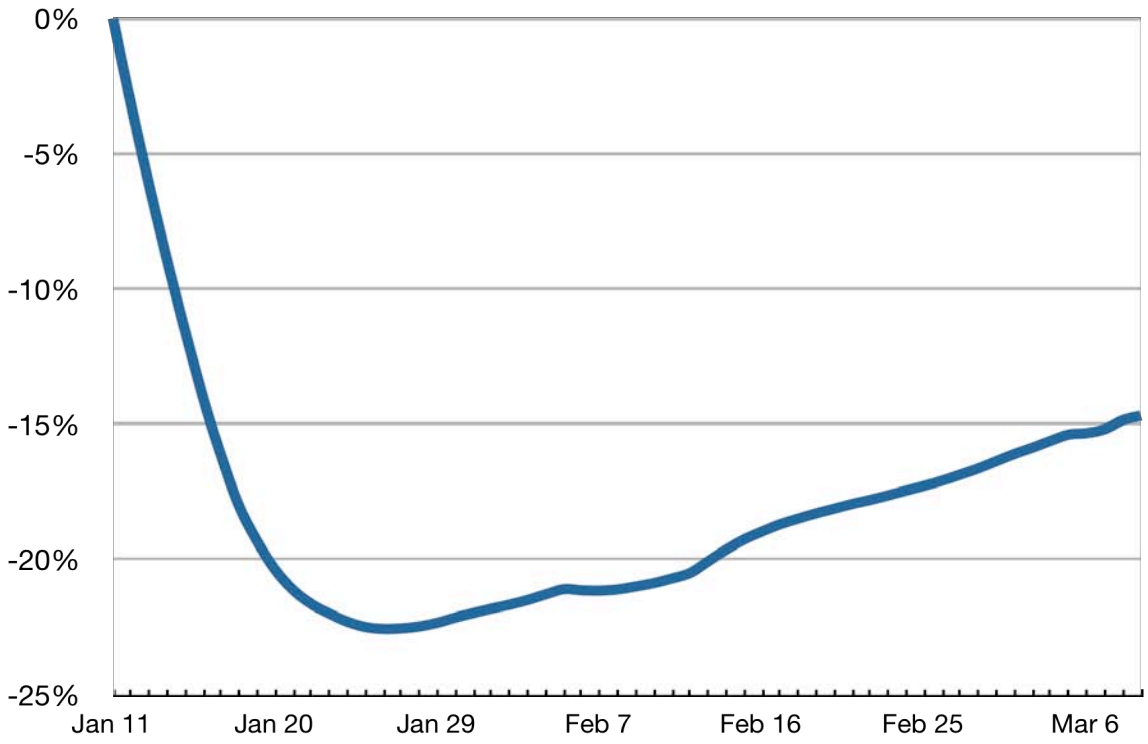


Figure 1: Estimated Port-au-Prince population change (relative to 11 January).[4]

4 The curve is smoothed to remove short term variations

Figure 2 below shows the same type of graph for the 10 departments, i.e. the estimated relative change in the population of each department compared to their pre-earthquake population levels.

At their peaks the ten departments experienced an estimated population increase of between 4.5 to 19%, mainly from the Port-au-Prince metropolitan area.

Sud and Nippes had the largest population increases while Grande-Anse and Sud-Est experienced maximum increases of 10%. Artibonite and Centre that were assumed to have experienced large increase have, in our analyses, relatively modest increases.

All departments have seen a gradual net out-migration since February. However, by March 11 all departments remained well above their pre-earthquake population levels (3 to 12% above).

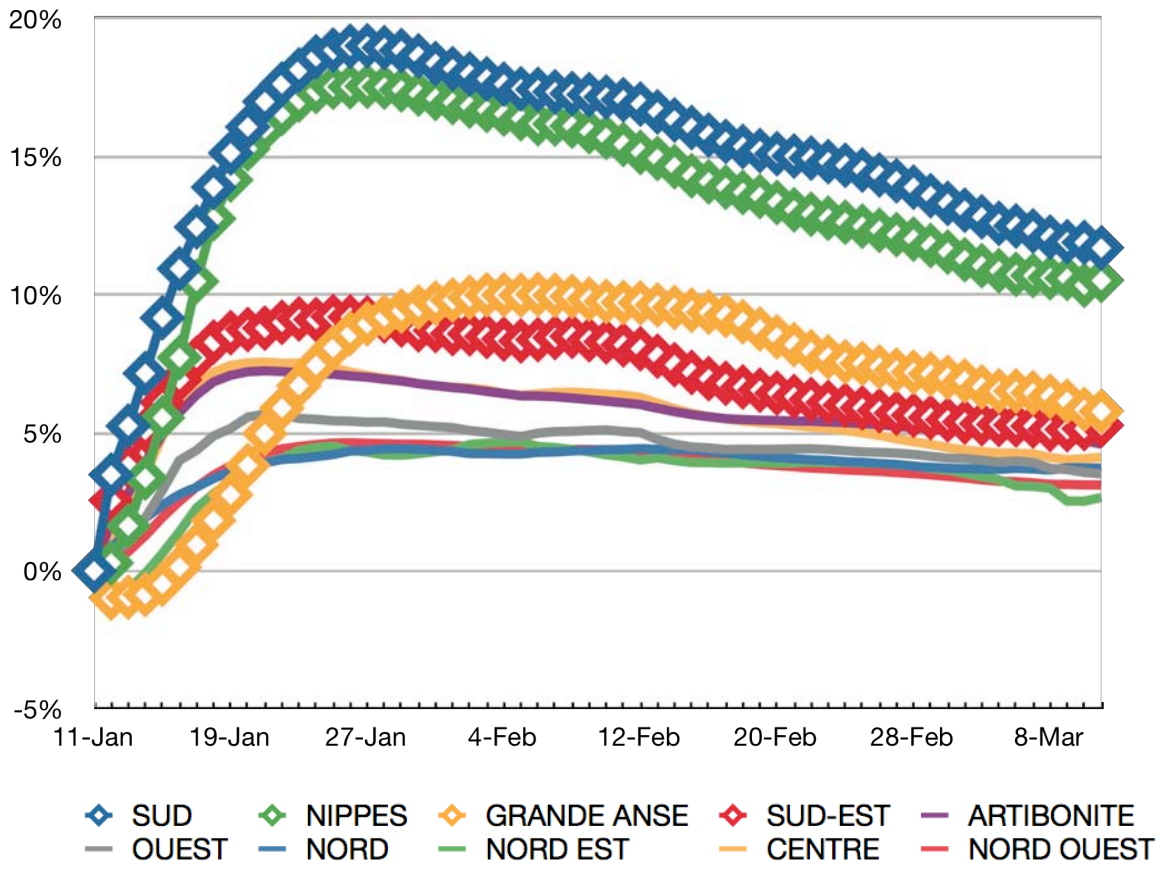


Figure 2: Estimated population changes in departments (relative to 11 January)[5]

5 The curve is smoothed to remove short term variations

3. A total of 41% of displaced persons have returned-back to Port-au-Prince

Figure 1 showed that an estimated 570,000 people had left Port-au-Prince and stayed outside Port-au-Prince on January 31st. Figure 3 below analyze the movements of these mobile phones and subdivide them based on if they had returned to Port-au-Prince by March 11 or not.

The figure shows that less than half of these phones (41%) had returned to Port-au-Prince on 11 March, while 59% remained outside Port-au-Prince.

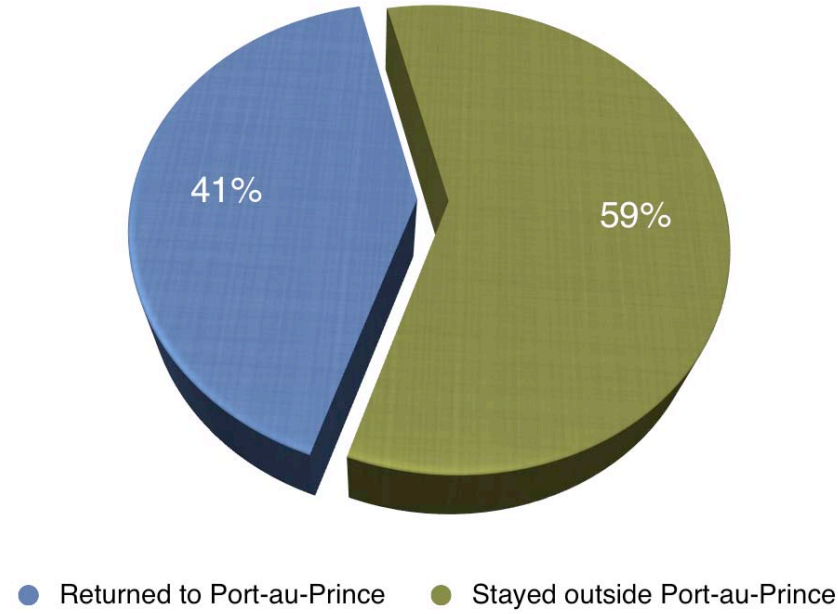


Figure 3: The percentage of the phones that had returned to Port-au-Prince on 11 March (out of the ones which had left and stayed outside Port-au-Prince on 31 January)

These phone movements suggest that out of the 570,000 people who had left Port-au-Prince on January 31,[6] about 230,000 persons had by March 11 returned while 330,000 were still outside this area.

6 The 570,000 persons include the people who had left and stayed outside Port-au-Prince on January 31st. The smaller group of people who left Port-au-Prince after the earthquake but had already returned before this date is not included in this figure.

4. Two-thirds of the phones that moved into Port-au-Prince after 31 January up to 11 March belonged to returning persons

Figure 2 showed that the estimated population of the Port-au-Prince metropolitan area increased steadily from the end of January and onwards. Figure 4 below describe the composition of the returning phones in more detail.

Figure 4 shows that out of the mobile phones that came into Port-au-Prince between 31 January to 11 March, the majority (68%) belonged to returnees who had stayed inside Port-au-Prince before the earthquake.[7]

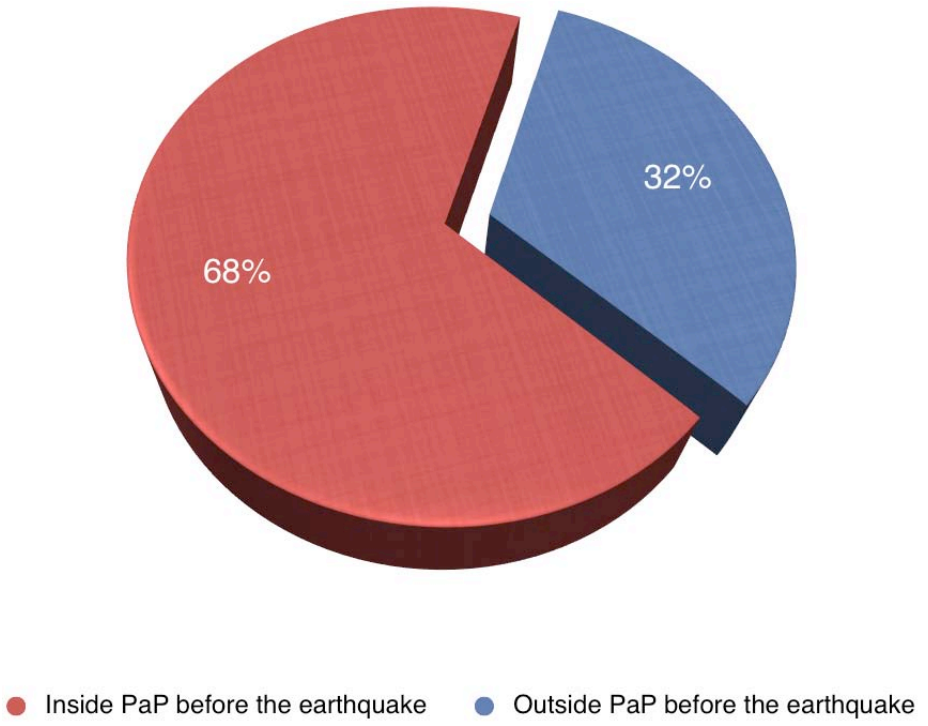


Figure 4: Phones moving into Port-au-Prince 1 February until 11 March

7 The absolute numbers of returning persons who did not belong to Port-au-Prince before the earthquake is presently difficult to estimate due to possible differences in in-migration rates into Port-au-Prince due to socio-economic levels.

E. Conclusions

Our study confirms previous estimates of the total number of persons displaced from Port-au-Prince following the earthquake. Our results indicate however that the geographic destinations of the estimated 570,000 persons who left and stayed outside Port-au-Prince at the end of January were considerably different from previous estimates.

The method we have used is very promising for tracking population displacement after disasters, especially in areas with high mobile phone coverage. Further studies and in-depth analysis is however required and we hope to return with such data.

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G. Additional acknowledgements

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H. Annex

Definition of Port-au-Prince metropolitan area

The following communal sections are included in the Port-au-Prince metropolitan area. The Port-au-Prince metropolitan area is also delineated in map 1.

17ème Procy	22ème Malanga
9ème Bizoton	3ème Bellevue
13ème Corail Thor	4ème Bellevue
16ème Taifer	7ème Bellevue Chardonnière
18ème Coupeau	1ère Montagne Noire
19ème Bouvier	3ème Etang du Jong
10ème Thor	4ème Bellevue la Montagne
2ème Varreux	1ère Varreux
21ème Berly	2ème Varreux
14ème Morne Chandelle	8ème Martissant
15ème Platon Dufréné	7ème Morne l'Hopital
11ème Rivière Froide	6ème Turgeau
20ème Laval	1ère Saint martin
1ère Petit Bois	2ème Varreux