Validation and Assimilation of OSM for the Global Roads Open Access Data Set

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State of the Map US – June 2015

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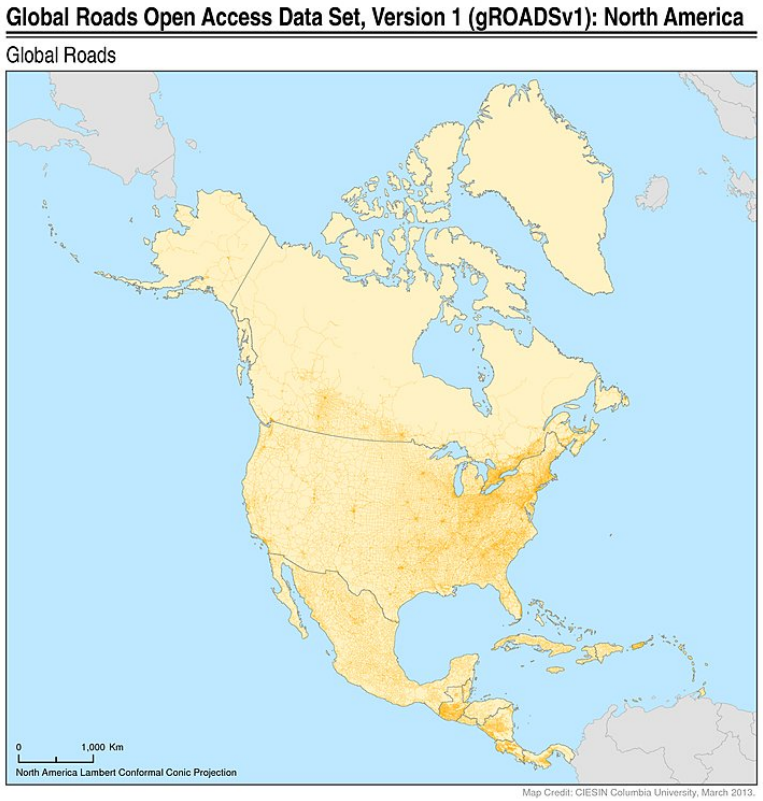
Summary

- OSM data are increasingly **viewed as authoritative** by development / humanitarian agencies to carry out relief and development work
- However, a question that often arises is, **how complete are the data in OSM for country X?**
- To help answer this question, we are collaborating with OSM to **assess road length, spatial coverage, attributes, and the geometry of OSM data**
- Goal is to **assimilate** OSM data into Global Roads Open Access Data Set (gROADS), version 2

Global Roads Open Access Data Set (gROADS)



- Goal: To develop a global roads open access data set (gROADS) that is:
  1. fit for modeling / research purposes (not navigation)
  2. Based on a globally consistent model (UNSDI-T)
  3. spatially accurate (~50m positional accuracy)
  4. topologically integrated
  5. focused on roads between settlements (not streets)
  6. well documented
  7. freely distributed (on attribution only basis)

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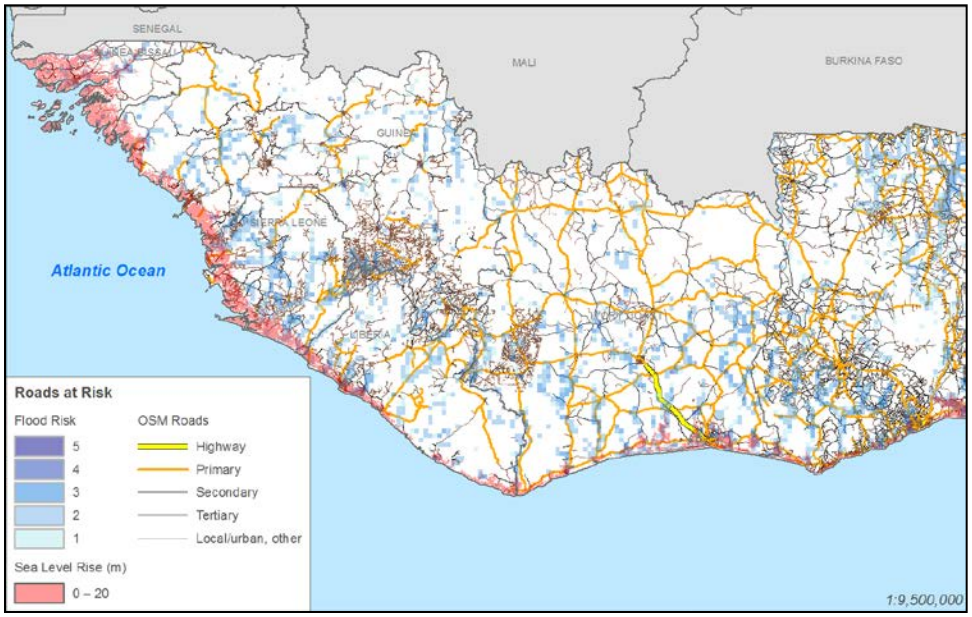
Prior OSM Validation work

- Barron et al. 2014, “A Comprehensive Framework for Intrinsic OpenStreetMap Quality Analysis”, *Transactions in GIS*.
- Goodchild and Li. 2012, “Assuring the quality of volunteered geographic information”, *Spatial Statistics.*
- Neis et al. 2012. “The Street Network Evolution of Crowdsourced Maps: OpenStreetMap in Germany 2007–2011”, *Future Internet.*
- Mooney and Corcoran. 2012. “Characteristics of Heavily Edited Objects in OpenStreetMap”, *Future Internet.*
- Koukoletsos et al. 2011. “An automated method to assess Data Completeness and Positional Accuracy of OpenStreetMap”, GeoComputation 2011.
- Gires and Touya. 2010, “Quality Assessment of the French OpenStreetMap Dataset”, *Transactions in GIS*.
- Cipeluch et al. 2010, “Comparison of the accuracy of OpenStreetMap for Ireland with Google Maps and Bing Maps”. Conference paper.
- Zielstra and Zipf. 2010, “A Comparative Study of Proprietary Geodata and Volunteered Geographic Information for Germany”, 13th AGILE International Conference on Geographic Information Science 2010, Guimarães, Portugal.

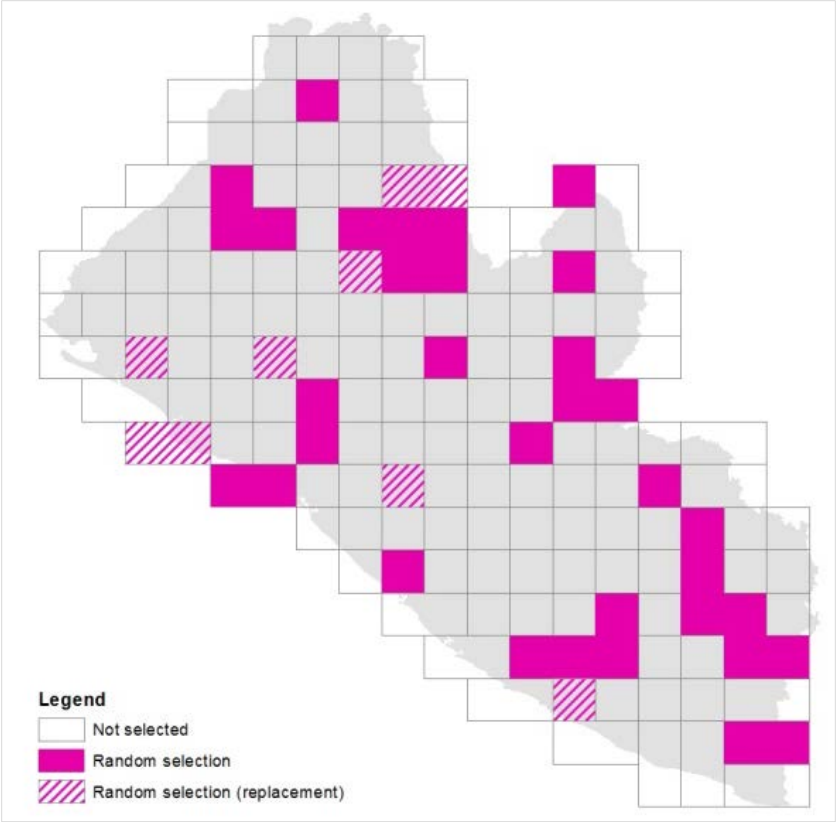
West Africa Analysis

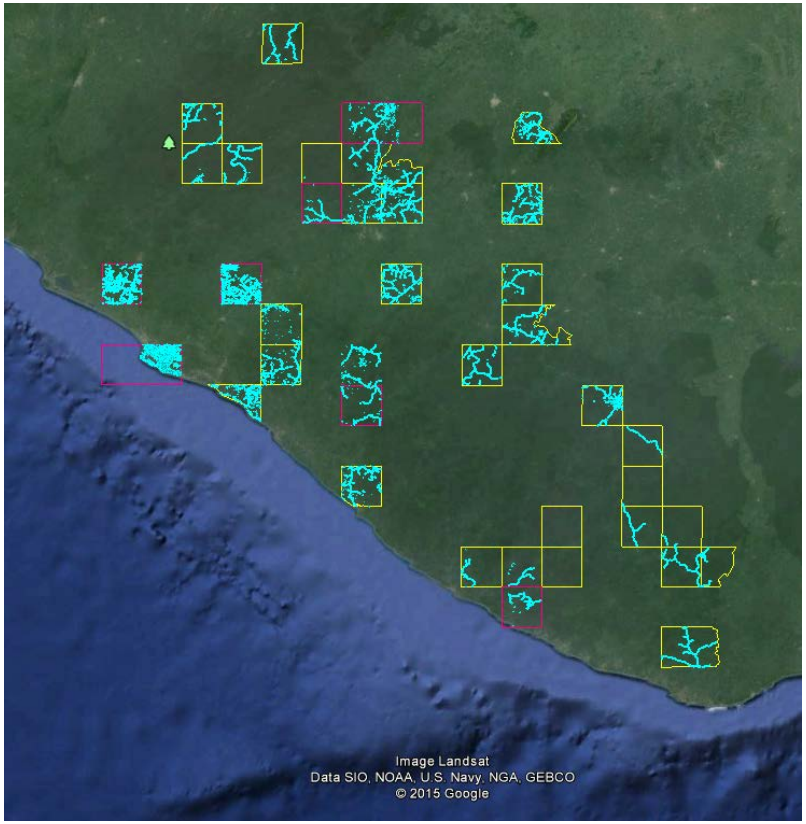
- Downloaded data in **May 2014** for a USAID project
- Downloaded data from Geofabrik in **May 2015**
- A very low income (OSM lagging) region
- Several countries (Guinea, Liberia and Sierra Leone) experienced a major outbreak of Ebola in 2014-15



Liberia: example random sampling procedure

Accuracy testing





Positional accuracy of OSM is generally very good

Results from accuracy testing

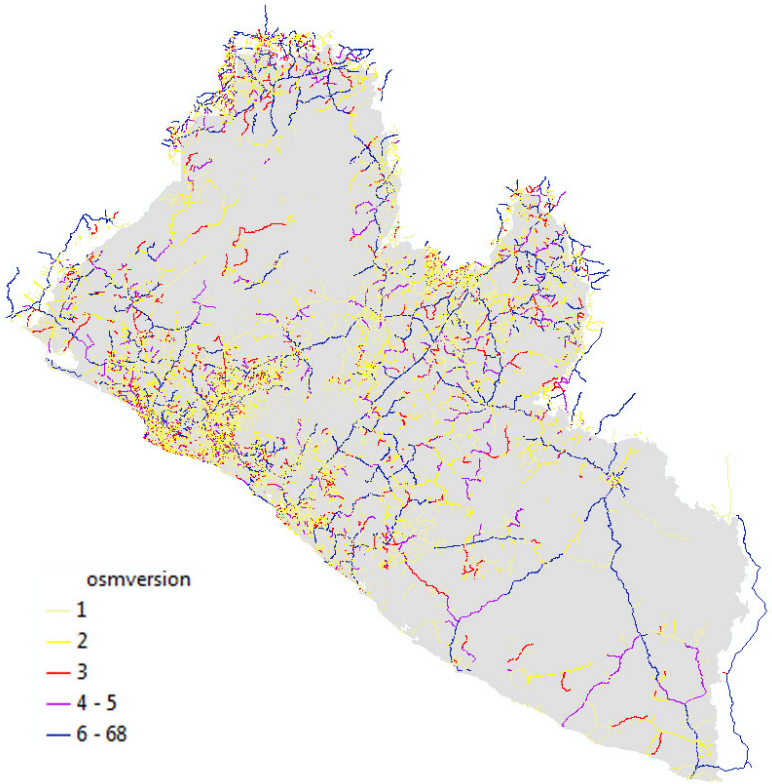
	Country	Ebola affected	RMSE (meters)	NSSDA accuracy (meters)
1	Ivory Coast	No	49	84
2	Cameroon	No	31	54
3	Guinea-Bissau	No	18	30
4	Liberia	Yes	22	38
5	Sierra Leone	Yes	13	23
6	Guinea	Yes	21	36

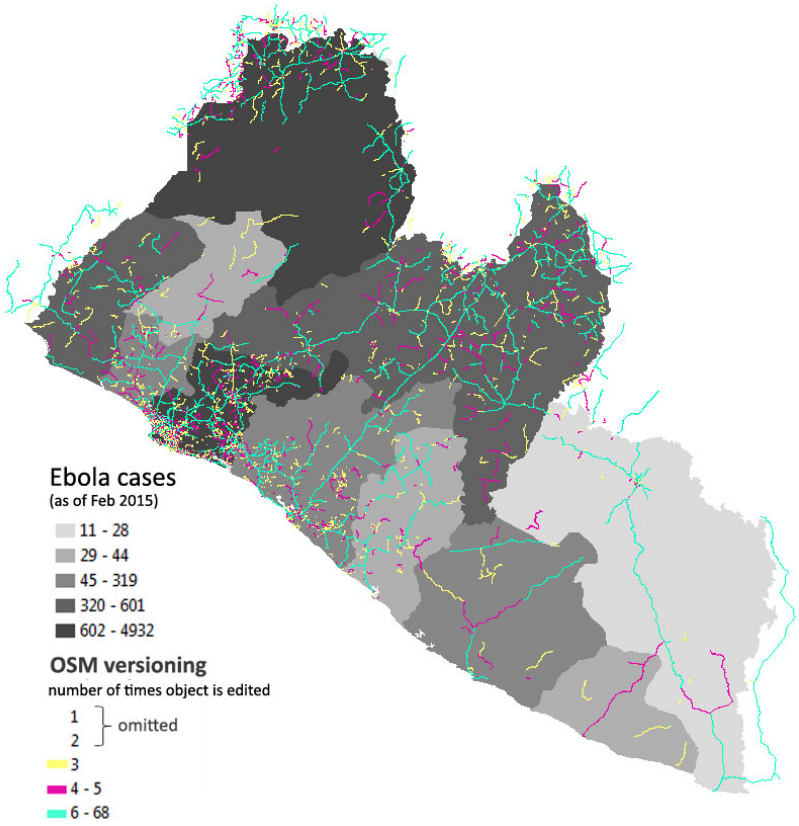
Some seemingly systematic spatial displacement in certain regions

Road length in ebola affected countries more than tripled, compared to a 50% increase for the other countries

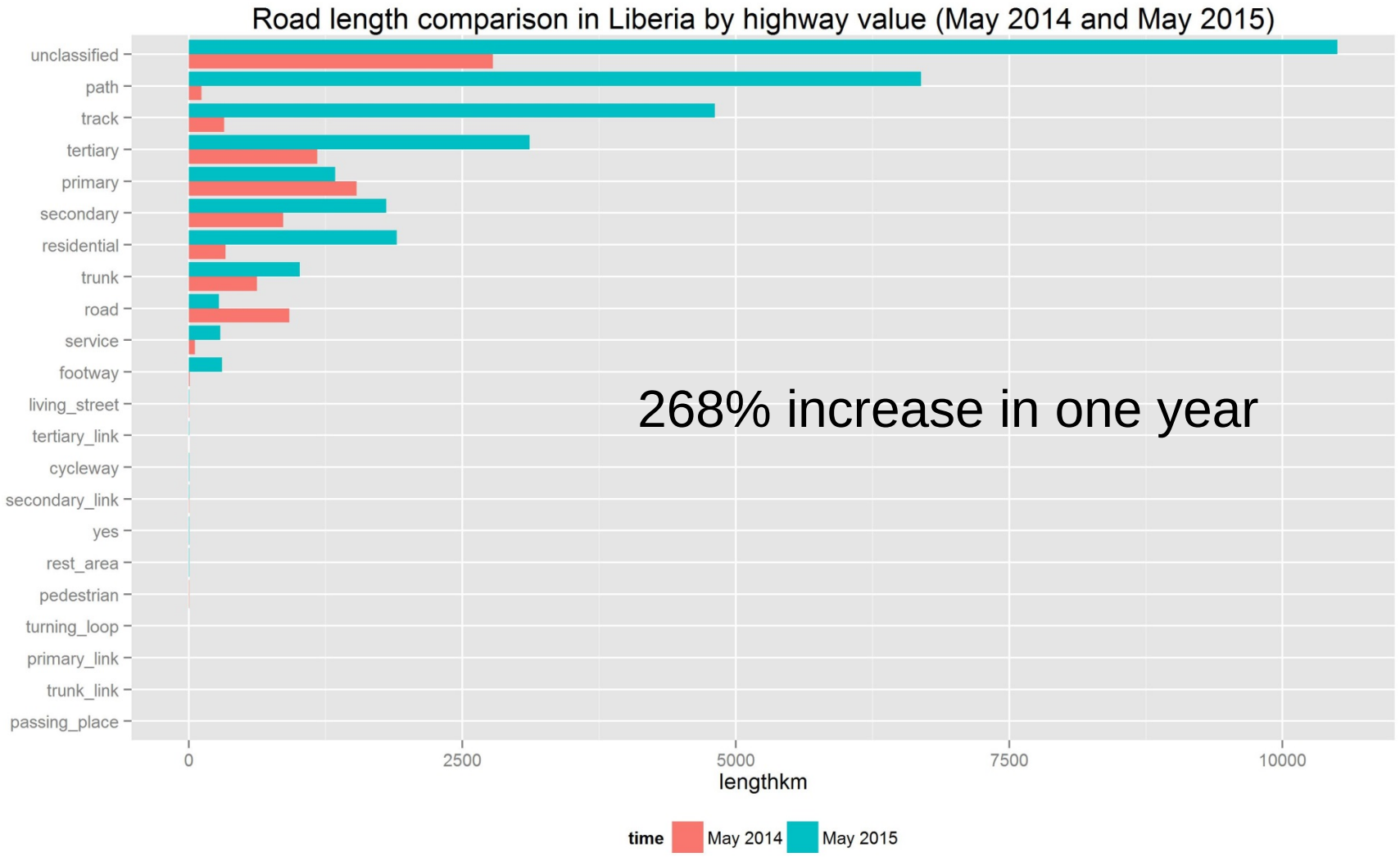
Country	May 2014 length (km)	May 2015 length (km)	Ebola affected	% change
Ivory Coast	32,769	59,081	0	80%
Cameroon	60,124	84,386	0	40%
Guinea Bissau	3,109	4,209	0	35%
Liberia	8,715	32,037	1	268%
Guinea	33,742	99,111	1	194%
Sierra Leone	11,459	50,401	1	340%
Non-Ebola countries	**96,003**	**147,677**	**0**	**54%**
Ebola countries	**53,917**	**181,551**	**1**	**237%**

Liberia: number of edits per road segment





Liberia: length increase by type



Validation and assimilation challenges

- OSM is rapidly evolving → a moving target
  - Validation at any point in time will soon be obsolete
  - Especially in countries that later experience disasters
- Absence of independent “objective” data in low income countries
  - Few authoritative commercial providers
  - High resolution imagery patchy in many countries
- Levels of detail and road types vary by country and may require simplifying and recoding for consistency

Ideas are welcome! www.groads.org