

Anparasan, Azrah A.; Lejeune, Miguel A.

Data laboratory for supply chain response models during epidemic outbreaks. (English)

Zbl 1434.90087

Ann. Oper. Res. 270, No. 1-2, 53-64 (2018).

Summary: Disasters in developing countries tremendously affect the economy and long-term development. Recent years have seen an increase in epidemic outbreaks in countries like Haiti and in West Africa. However, there seems to be a lack of decision support to address epidemic outbreak challenges in developing countries compared to their developed counterparts. The lack of data to implement such models is a potential reason. This paper presents a data set that will permit to develop data-driven allocation models and policies for an epidemic outbreak in a developing country. The data set is for the cholera epidemic that occurred in the aftermath of the 2010 earthquake in Haiti. The detailed time-series patient data is intended to facilitate the development and evaluation of multi-period supply chain models that support emergency health response, allocate medical resources and staff, and design coordination mechanisms among humanitarian stakeholders. We also provide a simple model to illustrate how the data can be utilized to develop a basic epidemic outbreak response model. The data set will be made available online for researchers interested in developing models in this field.

MSC:

90B90 Case-oriented studies in operations research

90B06 Transportation, logistics and supply chain management

92D30 Epidemiology

Keywords:

data-driven models; supply chain; health care; time-series data; epidemic outbreaks; emergency response

Software:

Google Maps API

Full Text: [DOI](#)

References:

- [1] Aaby, K.; Herrmann, JW; Jordan, CS; Treadwell, M.; Wood, K., Montgomery County's public health service uses operations research to plan emergency mass dispensing and vaccination clinics, *Interfaces*, 36, 569-579, (2006)
- [2] Anaya-Arenas, AM; Renaud, J.; Ruiz, A., Relief distribution networks: A systematic review, *Annals of Operations Research*, 223, 53-79, (2014) · [Zbl 1306.90021](#)
- [3] Anparasan, A. A., & Lejeune, M. A. (2017). [Data for epidemic outbreaks](http://www.milejeune.org/data.html). <http://www.milejeune.org/data.html>.
- [4] Apte, A.; Heidtke, C.; Salmerón, J., Casualty collection points optimization: A study for the district of Columbia, *Interfaces*, 45, 149-165, (2015)
- [5] Bhattacharya, S.; Hasija, S.; Wassenhove, LN, Designing efficient infrastructural investment and asset transfer mechanisms in humanitarian supply chains, *Production and Operations Management*, 23, 1511-1521, (2014)
- [6] Dasaklis, TK; Pappis, CP; Rachaniotis, NP, Epidemics control and logistics operations: A review, *International Journal of Production Economics*, 139, 393-410, (2012)
- [7] Drezner, T., Location of casualty collection points, *Environment and Planning C: Government and Policy*, 22, 899-912, (2004)
- [8] Farmer, P.; Almazor, CP; Bahnsen, ET; Barry, D.; Bazile, J.; Bloom, BR; Bose, N.; Brewer, T.; Calderwood, SB; Clemens, JD; et al., Meeting cholera's challenge to Haiti and the world: A joint statement on cholera prevention and care, *PLoS Neglected Tropical Diseases*, 5, 1-13, (2011)
- [9] Geohive. (2015). [Haiti—General information](http://www.geohive.com/cntry/haiti.aspx). <http://www.geohive.com/cntry/haiti.aspx>.
- [10] Geo Locator. (2015). <http://tools.freeseide.sk/geolocator/geolocator.html>.
- [11] Goentzel, J., & Heigh, I. (2015). Supply Chains in Crisis. [Inside Logistic](#). July 2015: 16-18. Institute for Supply Management.
- [12] Google. (2015). Google Maps Image APIs. Google Developers: <https://developers.google.com/maps/documentation/staticmaps/>.

Accessed February 25, 2015.

- [13] Green, LV, OM forum—The vital role of operations analysis in improving healthcare delivery, *Manufacturing & Service Operations Management*, 14, 488-494, (2012)
- [14] Hazen, B.; Skipper, J.; Boone, C.; Hill, R., Back in business: Operations research in support of big data analytics for operations and supply chain management, *Annals of Operations Research*, (2016)
- [15] IFRC. (2014). World Disasters Report 2014—Data: <https://www.ifrc.org/en/publications-and-reports/world-disasters-report/world-disasters-report-2014/world-disasters-report-2014—data/>. Accessed February 6, 2015.
- [16] Koyuncu, M.; Erol, R., Optimal resource allocation model to mitigate the impact of pandemic influenza: A case study for Turkey, *Journal of Medical Systems*, 34, 61-70, (2010)
- [17] Kraiselburd, S.; Yadav, P., Supply chains and global health: An imperative for bringing operations management scholarship into action, *Production and Operations Management*, 22, 377-381, (2013)
- [18] Lee, EK; Smalley, HK; Zhang, Y.; Pietz, F., Facility location and multi-modality mass dispensing strategies and emergency response for biodefence and infectious disease outbreaks, *International Journal of Risk Assessment and Management*, 12, 311-351, (2009)
- [19] Lemonick, DM, Epidemics after natural disasters, *American Journal of Clinical Medicine*, 8, 144-152, (2011)
- [20] Maskery, B.; DeRoeck, D.; Levin, A.; Kim, YE; Wierzba, TF; Clemens, JD, Strategy, demand, management, and costs of an international cholera vaccine stockpile, *Journal of Infectious Diseases*, 208, s15-s22, (2013)
- [21] McCoy, JH; Johnson, ME, Clinic capacity management: Planning treatment programs that incorporate adherence, *Production and Operations Management*, 23, 1-18, (2014)
- [22] MSPP. (2011). Documentation. Ministry of Health and Population, Haiti. http://www.mspp.gouv.ht/site/index.php?option=com_content&view=fulltext&layout=edit&Itemid=1
- [23] MSPP and CDC. (2011). *Haiti cholera training manual: A full course for health care providers*. http://www.cdc.gov/haiticholera/pdf/haiticholera_training_manual.pdf
- [24] Natarajan, KV; Swaminathan, JM, Inventory management in humanitarian operations: Impact of amount, schedule, and uncertainty in funding, *Manufacturing & Service Operations Management*, 16, 595-603, (2014)
- [25] Prasad, S., Zakaria, R., & Altay, N. (2016). Big data in humanitarian supply chain networks: A resource dependence perspective. *Annals of Operations Research*. doi:10.1007/s10479-016-2280-7.
- [26] Rachaniotis, NP; Dasaklis, TK; Pappis, CP, A deterministic resource scheduling model in epidemic control: A case study, *European Journal of Operational Research*, 216, 225-231, (2012)
- [27] Rahman, S.; Smith, DK, Use of location-allocation models in health service development planning in developing nations, *European Journal of Operational Research*, 123, 437-452, (2000) · [Zbl 0962.91514](#)
- [28] Russom, P. (2011). Big data analytics. TDWI best practices report, fourth quarter. http://www.tableau.com/sites/default/files/whitepapers/tdwi_big_data_analytics.pdf. Accessed November 5, 2016.
- [29] Simchi-Levi, D., OM forum-OM research: From problem-driven to data-driven research, *Manufacturing & Service Operations Management*, 16, 2-10, (2014)
- [30] UNDP. (2015). Multi-partner trust fund office gateway. UNDG Haiti Reconstruction Fund. <http://www.lessonsfromhaiti.org/download/International-overall-financing-data.pdf>. Accessed October 4, 2015.
- [31] UNISDR. (2015). Disaster statistics. The United Nations Office for Disaster Risk Reduction. <http://www.unisdr.org/we/inform/disaster-statistics>. Accessed May 6, 2015.
- [32] WHO. (2004). *Cholera outbreak: Assessing the outbreak response and improving preparedness*. <http://www.who.int/cholera/publications/assessment-report-2004.pdf>
- [33] World Bank. (2014). *The economic impact of the 2014 Ebola Epidemic: Short and medium term estimates for West Africa*: <http://www.worldbank.org/en/region/afr/publication/the-economic-impact-of-the-2014-ebola-epidemic-short-and-medium-term-estimates-for-west-africa>. Accessed July 24, 2015.
- [34] Xiang, Y.; Zhuang, J., A medical resource allocation model for serving emergency victims with deteriorating health conditions, *Annals of Operations Research*, 236, 177-196, (2016) · [Zbl 1345.91015](#)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.