Urban ARK Background Paper

The data gap: An analysis of data availability on disaster losses in sub-Saharan African Cities

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1.0 Introduction

About 40% of Africa's population live in urban areas (UNDESA 2015), with 50 cities having more than 1 million inhabitants (Parnell and Pieterse 2014: 4). Africa's rate of urbanisation has soared from 15% in 1960 to 40% in 2010 and is expected to top 64% by 2050, making it the world's second most rapidly urbanising continent following Asia (UNDESA 2015). Africa and Asia are expected to account for 90% of the world's future urban population growth by 2050, by which time they will account for 52% and 21% of the world's total urban population, respectively (ibid). A significant share of Africa's contribution to this growth is expected to occur in small urban centres of less than 50,000 inhabitants, although it is the growth of large cities that attract most attention in the literature (Satterthwaite 2015b).

Africa's urban transition will lead to a drastic change in the profile of the region, raising significant challenges for sustainable development and any attempts to deal with its poverty crisis (Friere et al, 2014). Africa's poor infrastructure, GDP levels and developmental indices combined with a lack of local capacity to plan and manage rapid urban growth and change pose significant challenges for many urbanising countries in the region (ibid). Of growing concern are rural-urban migrants, who account for about one-third of urban population growth in the sub-continent and who comprise a large proportion of the urban poor (Tacoli et al., 2015). The urban poor are among those most at risk to disasters given their tendency to live in informal settlements located in hazard-prone areas lacking risk reducing infrastructure (Pelling and Wisner, 2009; Adelekan et al., 2015). In this context, large numbers of urban residents have been exposed to hazards (both natural and technological) that often lead to disasters (World Bank, 2010). Understanding and documenting impacts from disasters is the foundation for decision-making and policy-setting in disaster risk reduction.

However, considering that urbanization is contributing to the accumulation of risks in many SSA countries, it is of interest to know more about how disasters are affecting people and property at the sub-national level of the urban areas (Adelekan, 2015). Satterthwaite (2015a) discusses the importance of urban risks, which include the small-scale, everyday disasters and risks that have an implications on the population, including the health and wellbeing of the people and which if not addressed easily accumulates and pose greater obstacles to development.

This paper examines the availability of data on disaster losses in urban areas in sub-Saharan Africa (SSA) and what this data tells us. Following the introduction, section two reviews the concept of disaster losses, and examines how they are used by the major databases. Sections three to seven look at the different kinds of data sets available—section three examines the extent to which the major disaster databases capture the effects of different disaster events and section four uses the DesInventar database to analyse losses in major urban centres of SSA. Section five overviews other databases and data sources from the health sector that could shed light on everyday risks and endemic health related losses and section six presents data sources on disaster losses compiled by humanitarian agencies in select SSA city case studies. Section seven and eight conclude by examining the key limitations of the databases and data sources reviewed, and by identifying potential areas of interests for urban researchers. This paper has been written as a background paper for the Urban ARK programme[1].

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[1] Urban ARK (Urban Africa Risk Knowledge) is a three-year research and capacity-building programme funded by the Economic and Social Research Council (ESRC) and the Department for International Development (DFID) of

2.0 Overview of concept of disaster losses

The purpose of this paper is to explore the availability of data on disaster losses in urban areas of SSA and to see what this data tells us about urban risks. However, it is worth noting that there are different ways of measuring disasters and the risks they pose (see Figure 1). Studies that propose to forecast future risk for an area will be based on one or more often a combination of these methods:

1) **Disaster losses** look at understanding the past impacts of different kinds of hazards and across different scales of disasters. Losses are organised around a particular disaster 'event' – and the registering of an event means that there has been a human or economic loss. Disaster losses are often used as a proxy for understanding what will happen in future.
2) **Vulnerabilities:** Potential disasters, or risks can also be measured through understanding the social and environmental factors that affect vulnerability to a particular hazard, as well as the structural factors that lead to this vulnerability. Vulnerability measurements require indicators. In urban areas in SSA indicators linked to measurements of poverty or health can be useful, such housing quality, amount of space per person, type of cooking fuel, provision of water or sanitation, as well as capacities of individuals, communities and the state.
3) **Natural hazards:** Potential of natural and technological hazards can also be measured through data of natural or physical processes or systems, such as, for flooding, data from satellites, ground weather radars, and rain gauges about how much rainfall occurs how much water is likely to be absorbed by soil, where the water will flow over the landscape if it not absorbed, and how it will move once it enters the river system.
4) **Exposure:** Measurements of the amount of people and assets *exposed* in a given area will usually be part of any of these three kinds of measurements.

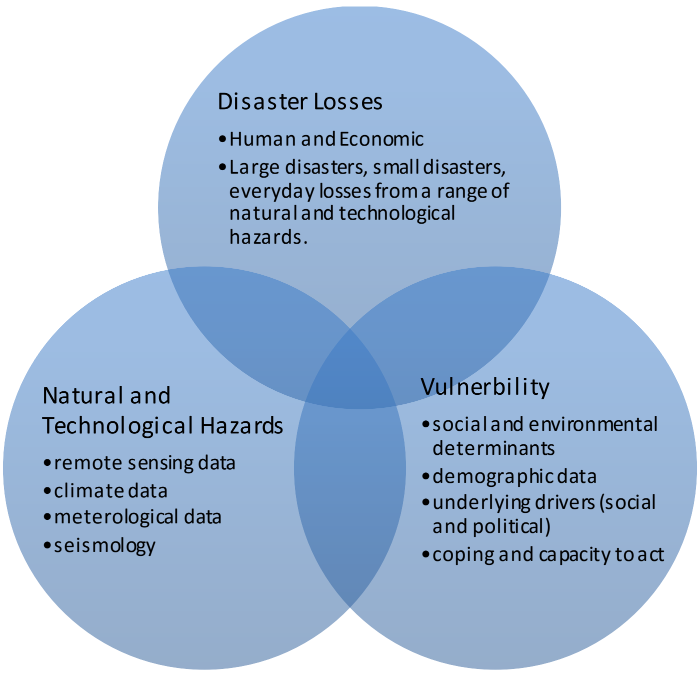

Figure 1: Different ways of measuring risks

the United Kingdom. It aims to better understand the nature and scale of urban risk in SSA, drawing on several case studies across the continent, including Dakar (Senegal), Ibadan (Nigeria), Karonga Town (Malawi), Mombasa and Nairobi (Kenya) and Niamey (Niger) and others. For more details, see: www.urbanark.org

Disaster Loss databases

The occurrence of disasters events have been increasingly documented and accounted for in international disaster databases. The United Nations Development Program's Global Risk Information Platform (GRIP) website has a comprehensive list of disaster database classified as global, regional or national, and this indicates that there are four global disaster databases, EM-DAT, Global Disaster Identifier Number (GLIDE), University of Richmond Disaster Database Project and NatCatService. EM-DAT[2] is especially useful for comparing across regions and countries and has the largest number of entries for global datasets and one can create their own dataset online. GLIDE contains 1483 entries for Africa (and more than 6000 globally) and one can search by country. Each event is given an identifier number and includes a map and detailed comments on each event. The GLIDE numbering system is also used in other databases. Richmond and NatCat are not publically available. Dartmouth Flood Observatory has an archive of over close to 4000 large flood events and can be searched by country. The database includes detailed information on location, losses and duration as well as a description of the event. DesInventar[3] is a collection of national databases, which currently has 89 countries and is growing in scope, including sub-national data on 15 countries in SSA (Comoros, Djibouti, Ethiopia, Kenya, Madagascar, Mali, Mozambique, Morocco, Mauritius, Niger, Togo, Tunisia, Senegal, Sierra Leone, Seychelles and Uganda) and partial data on Tanzania (Zanzibar). EM-DAT and DesInventar are the most popular international databases and are widely cited in policy documents and research analyses (Guha-Sapir and Hoyois, 2012), and these databases will be the focus of this section. Both EM-DAT and DesInventar attempt to aggregate and classify data to make it easy to analyse both the types and effects of the disasters recorded.

The DesInventar and EM-DAT, and other databases, are working based on a common standardized classification and definition of types of perils and hazards, which is appended in Annex 1 (Integrated Research on Disaster Risk, 2014). This includes geophysical, hydrological, meteorological, climatological, biophysical and extraterrestrial however this doesn't include all of the kinds of events that are in the databases, such as accidents, building collapse or conflicts.

Guidelines also exist on measuring losses from disasters (Integrated Research on Disaster Risk, 2015)[4]. Losses are categorised as either 'human' or 'economic' losses and are further divided into Primary indicators as per Table 1. Since these guidelines are relatively recent, they are only beginning to be applied systemically by the major databases. However, we do question whether the categories related to economic losses are well-suited to assessing the disaster impacts that are relevant to most low-income households SSA, for example, damage to housing, disrupted livelihoods and loss of household assets; instead they seem to be focused more on larger-scale impacts.

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[2] The EM-DAT (Emergency Events Database) is a free and open access data source on global disaster events managed by The Centre for Research on the Epidemiology of Disasters (CRED) at the Université Catholique de Louvain (UCL) in Belgium. See further www.emdat.be.

[3] The DesInventar ('Disaster Inventory System') is a conceptual and methodological tool for the generation of National Disaster Inventories and the construction of databases of damage, losses and in general the effects of disasters. See further www.desinventar.net.

[4] It is worthwhile noting that the concept of disaster losses is slightly different to the concept of "loss and damage," which has received increased attention in recent years as a framing of the impacts of climate change. Dodman and Mitlin (2014) refer to "damage" as impacts from climate change that can be recovered, whereas "loss" cannot be recovered. However, the term "disaster loss" refers to any kind of impact.

Table 1: Definitions of types of Losses from Disasters (adapted from: Integrated Research on Disaster Risk, 2015)

Type of Loss	Primary Indicator[5]	Definition
Human Losses	Deaths	Number of people who lost their life because the event happened
	Missing	Number of people whose whereabouts since the disaster are unknown and presumed dead based on official figures
	Injured	People suffering from physical injuries, trauma, or an illness requiring immediate medical assistance as a direct result of a disaster
	Exposed	Number of people who permanently or temporarily reside in the hazard area before or during the event
Economic Losses	Primary Economic Loss	The amount of damage to property, crops, and livestock and to the flow of goods and services expressed in monetary terms
	Secondary and tertiary economic loss	Can be further divided into insured and uninsured.
	Sector-based economic loss	Such as those related to tourism, agriculture, transportation, power generation, manufacturing and the like. Could also be indicated at percentages, or spatial units, i.e. measure of length of damaged water infrastructure.

The databases have different thresholds about what they consider to be a disaster event. In EM-DAT, for a disaster event to be recorded it must fulfil one of the following criteria: have 10 or more people deaths, 100 or more people affected/injured/homeless, or declaration by the country of a state of emergency and/or an appeal for international assistance. Whereas the definition for DesInventar database is 1 or more human losses or $1 or more in economic losses. DesInventar uses national newspapers, police and public health reports as sources of information and will include a disaster event if there is any kind of human or economic loss. EM-DAT is compiled from various sources including UN, governmental and non-governmental agencies, insurance companies, research institutes and press agencies has a wide range of sources. Thus, these two databases can portray quite different pictures of disaster losses in a country. The DesInventar methodology gives a stronger indication of spectrum of disaster events and considerable analysis has been undertaken to understand the differences between losses from large (intensive) disaster events and smaller scale (extensive) events (UNISDR 2015, 2013, 2011) and is more conducive to understanding the breadth of everyday losses, small disasters and large disasters in urban areas of SSA that are the concern of Urban ARK (see Satterthwaite thematic note on extensive risk).[6] DesInventar defines extensive risk as "the risk layer of high-frequency, low-severity losses [that] manifests as large numbers of recurrent, small-

[5] There are also additional secondary and tertiary indicators for human losses, such as Homeless, Evacuated, Relocated and Affected.

scale, low severity disasters which are mainly associated with flash floods, landslides, urban flooding, storms, fires and other localized events" (UNISDR 2015:90). The analysis of the available data showed that a majority of the loss and damages since 1990 have been associated with extensive disasters. The losses from extensive disasters accounted for most of the disaster morbidity and displacement, and were a particular challenge for areas already vulnerable because of poor infrastructure and under-development (UNISDR, 2015:96).

3.0 National level disaster losses in SSA

The major databases show that disasters in SSA are dominated by weather-related hazards such as floods, cyclones and storms, and drought (World Bank, 2010). The major databases also show that in addition to the dominance of natural hazards, the disaster profile of SSA also show the occurrence of disease epidemics, fires, accidents and earthquakes.

Table 1 below shows a summary of the losses from natural disasters in sub-Saharan Africa between 2010 and 2015. At the national level, the scale of the problem is easily appreciated. Between 2010 and 2015, over 80 million people in SSA were affected by large-scale natural disasters, resulting in 45,733 deaths. Considering that there were only 354 disaster events recorded in all the SSA countries during the 5-year period, the fatality rate is relatively high at about 129 deaths per disaster incident. This was found to be significantly higher than natural disaster death rates in South East Asia and Latin America, within the same period.

Table 2: Natural disasters and extent of damage and loss in SSA 2010-2015, EM-DAT data

Region	Country	Occurrence	Death	Affected	Injured	Homeless	Total affected	Total Damage
Central	Angola	10	233	2,036,359	31	79,570	2,947,997	
West	Benin	9	82	775,098	1000	152,759	928,857	
South	Botswana	2	12	4210	0	0	4210	
West	Burkina F	6	877	7,000,705	13	21,000	7,021,718	
East	Burundi	9	139	3275	232	14,000	17,507	
Central	Cameroun	10	1307	327,436	95	34,980	362,511	
West	Cape Verde	1	0	2,500	0	0	2,500	
Central	CAR	9	20	48,225	121	3,870	52,216	
Central	Chad	10	928	2,383,360	0	0	2,383,360	
East	Comoros	3	4	84,498	150	0	84,684	
Central	Congo	8	324	14,496	89	7,500	22,085	
Central	Congo DR	18	1,569	134,917	1,057	12,490	148,464	
West	Cote D'Ivoire	5	80	6,425	0	0	6,425	
East	Djibouti	1	0	200,258	0	0	200,258	
East	Ethiopia	10	145	5,979,334	0	0	5,979,334	
Central	Gabon	5	1	81,926	0	0	81,926	
West	Gambia	5	11	470,261	0	0	470,261	
West	Ghana	12	529	178,917	262	0	179,179	
West	Guinea	7	2,455	84,476	6	4,000	88,482	
West	Guinea Bissau	1	2	56,792	0	0	56,792	
East	Kenya	19	593	10,361,686	3,479	5,000	10,370,165	
South	Lesotho	4	26	730,515	0	2,600	733,115	
West	Liberia	2	4,500	25,714	0	0	25,714	
East	Madagascar	13	551	2,981,349	1,328	225,551	3,208,228	
East	Malawi	13	294	2,817,461	651	350	2,818,462	
West	Mali	9	93	4,194,612	0	0	4,194,612	
West	Mauritania	4	8	1,550,975	0	2,305	1,553,280	
East	Mauritius	1	11	0	82	0	82	

East	Mozambique	18	363	1,153,217	3,737	0	1,156,954	
South	Namibia	6	133	956,150	518	0	956,668	
West	Niger	18	599	4,125,396	5,009	34,790	4,165,195	
West	Nigeria	17	4,073	8,739,594	1,229	500	8,741,323	
East	Rwanda	5	42	18,173	43	5,920	24,136	
West	Senegal	8	29	1,817,582	163	0	1,817,745	
East	Seychelles	2	0	7,435	0	0	7,435	
West	Sierra Leone	6	4,184	35,422	5	2,257	37,684	
East	Somalia	12	20,211	7,649,380	0	20,200	7,669,580	
South	South Africa	9	135	347,011	540	3,500	351,051	
South	Swaziland	1	11	400	0	0	400	
East	Tanzania	9	137	1,109,000	312	6,776	1,116,088	
West	Togo	4	89	111,954	0	0	111,954	
East	Uganda	14	709	1,008,838	1,255	3,368	1,013,461	
South	Zambia	6	11	4,528	0	20,150	24,678	
South	Zimbabwe	13	213	3,883,536	3	475	3,884,014	

Natural disasters analysis from Table 1
Total affected: 75,020,790
Number of incidents: 354
Number of deaths: 45,733
Deaths per incident: 129.2

There are problems with measuring economic losses using the major databases, which mainly focus on loss of life, injury and displacement. Detailed information on economic (or monetised) losses were poorly documented in the EM-DAT database, hence the blank column in the Table 1. Non-economic losses were poorly documented as well. For example, the categories for 'death' and 'injury' do not include morbidity as a secondary effect, even though disasters often create the conditions for disease transmission and the spread of epidemics (IFRC 2010). The data in Table 1 further suggest that the number of people injured may be under-reported considering the total number of people affected by event.

A more detailed breakdown of the different types of natural disasters in selected SSA countries is presented in Table 2 (also from EM-DAT data). The financial losses were only computed for flood events, despite the relative importance of other types of disasters from country to country. During the period 2010-2015, there were a total of 39 flood disasters reported in Kenya, Nigeria, Niger, Senegal, Uganda and Ethiopia, and resulting in 1,320 deaths and a total damage bill of just over $750 million. The fatality rate of flooding in these 6 countries, within that period was 34 deaths per each reported case, and a relative damage of $19 million per flood.

The detailed data available on DesInventar, for the same period (Table 3 below) provides a more detailed account of loss and damage by detailing the number of 'houses destroyed' and 'houses damaged', and the number of deaths, injuries and missing persons by disaster event. There was very limited information on the monetized losses from the disaster incidents, however unlike EM-DAT data that had financial losses computed for only floods, there was some detail on the financial losses from droughts, coastal erosion and fires, within the limited data available.

Table 3: Summary of natural disasters and extent of damage/loss in selected SSA countries 2010-2015, EM-DAT

Country	Disaster Type	Disaster subtype	Events Counted	Total Deaths	Total Affected	Total Damage ('000 US $)
Malawi	Drought	Drought	1	0	1900000	0
	Epidemic	Bacterial disease	1	2	5	0
	Flood	Riverine flood	9	287	912107	0
	Storm	Convective storm	1	5	350	0
	Storm	Tropical cyclone	1	0	6000	0
Kenya	Drought	Drought	3	0	9650000	0
	Epidemic	Viral disease	1	11	1046	0
	Epidemic	Bacterial disease	2	118	6293	0
	Flood	Flash flood	1	13	1500	0
	Flood	Riverine flood	11	441	711326	136000
	Landslide	Landslide	1	10	0	0
Nigeria	Epidemic	Bacterial disease	4	3262	101273	0
	Epidemic	Viral disease	3	174	1550	0
	Flood	Riverine flood	8	611	8623488	534500
	Storm	Convective storm	2	26	15012	1000
Niger	Animal accident	--	1	12	5	0
	Drought	Drought	1	0	3000000	0
	Epidemic	Bacterial disease	5	169	7427	0
	Epidemic	Viral disease	3	238	5803	0
	Flood	Riverine flood	8	180	1151960	67474
Mali	Drought	Drought	2	0	4100000	0
	Epidemic	Viral disease	1	6	7	0
	Epidemic	Bacterial disease	1	49	1190	0
	Flood	Riverine flood	5	38	93415	0
Senegal	Drought	Drought	2	0	1489702	0
	Epidemic	Viral disease	1	0	1	0
	Flood	Riverine flood	5	29	328042	10000
Tanzania	Drought	Drought	1	0	1000000	0
	Flood	--	1	12	5000	0
	Flood	Flash flood	1	3	20000	0
	Flood	Riverine flood	5	75	85976	0
	Storm	Convective storm	1	47	5112	0
Uganda	Drought	Drought	1	0	669000	0
	Epidemic	Bacterial disease	2	125	222991	0
	Epidemic	Viral disease	5	107	1676	0
	Flood	Riverine flood	3	40	103520	3100
	Landslide	Landslide	2	406	16227	0
	Storm	Convective storm	1	23	47	0
Ghana	Epidemic	Bacterial disease	4	371	42395	0
	Epidemic	Viral disease	2	65	566	0
	Flood	--	1	25	0	0
	Flood	Riverine flood	5	88	136218	0
Ethiopia	Drought	Drought	2	0	5805679	0

	Epidemic	Viral disease	3	110	288	0
	Epidemic	Bacterial disease	1	16	967	0
	Flood	Riverine flood	4	19	172400	2200

Disaster analysis for Kenya, Nigeria, Niger, Senegal, Uganda and Ethiopia (2010-2015) Table 2 above

Floods
Total flood incidents: 39
Total deaths: 1320
Total affected: 11,090,736
Total damage ($):753,274,000
Death per flood: 33.8
Damage per flood ($): 19,314,717.95

Droughts
Total Drought incidents: 14
Total deaths: 0
Total affected: 27,614,861
Death per drought: 0
Total affected per incident: 1,972,455.79

Disease Epidemics (viral and bacterial)
Total Disease epidemics incidents: 33
Total deaths: 5,417
Total affected: 393,478
Death per epidemic: 164.15

Table 4: Summary of Natural disasters and extent of damage and loss in select SSA countries 2010-2015, DesInventar

Country	Event	Events Counted	Deaths	Injured	Missing	Houses Destroyed	Houses Damaged	Affected	Losses US$
Kenya (2010 – 13)	Drought	317	0	0	0	0	0	3179366	0
	Epidemic	8	8	0	0	0	0	151	0
	Extreme Rains	40	0	0	0	0	0	0	0
	Flash Flood	3	0	0	0	75	0	0	0
	Flood	341	478	28	10	11028	2246	330226	0
	Landslide	14	37	7	2	96	0	1794	0
	Mudslide	3	4	0	0	0	0	80	0
	Storm	1	5	0	4	0	0	0	0
	Thunderstorm	18	25	14	3	1	1	3	0
	Windstorm	7	0	0	0	6	10	36	0
Niger (2010 – 14)	Drought	97	0	0	0	0	0	173563	0
	Epidemic	77	1288	0	0	0	0	0	0
	Fire	66	26	0	0	217	0	1261	0
	Flood	567	730	174	0	64277	1224	47094	0
	Forest Fire	110	0	0	0	0	0	18	0
	Other	276	4957	4	1250	0	0	53148	0
	Rains	1	0	0	0	0	0	0	0
Mali (2010 – 12)	Drought		245	0	0	0	0	0	4217190
	Flood		222	131	228	0	9892	985	37094
	Forest Fire		23	0	0	0	0	0	0
	Thunderstorm		1	1	0	0	0	0	0
Senegal (2010 -14)	Accident	376	728	2082	0	4	0	0	0
	Mudslide (Dégradation Des Terres)	4	0	0	0	0	0	0	0
	Building Collapse	104	74	338	0	26	177	0	0
	Epidemic	7	3	0	0	0	0	113	0
	Coastal Erosion (Erosion Côtière)	2	0	2	0	0	40	0	400000
	Bushfires	715	0	0	0	0	0	0	0
	Lightening	53	68	52	0	0	7	0	0
	Fires	205	77	55	0	136	728	2197	26153692
	Bird Investation (Infestation Aviaire)	1	0	0	0	0	0	0	0
	Flood	93	54	15	2	267	12264	41653	187637
	Shipwreck (Naufrage)	22	174	68	4	0	0	0	0
	Drowning	360	603	54	7	0	0	11	0
	Rainstorm (Pauses Pluviométriques)	13	0	0	0	0	0	1104	0
	Drought	1	0	0	0	0	0	0	0
	Extreme Temperature	2	13	0	0	0	0	0	0
Uganda (2010 -14)	Accident	14	45	98	0	0	0	0	0
	Animal Attack	19	1	16	0	0	0	0	0
	Cyclone	1	0	0	0	75	0	0	0
	Drought	189	12	0	0	0	0	0	0
	Epidemic	30	259	0	0	0	0	45	0

	Fire	79	19	30	0	513	5	87	0
	Flash Flood	1	0	9	0	20	0	0	0
	Flood	532	69	5	4	5280	315	215	0
	Frost	1	0	0	0	10	0	0	0
	Hailstorm	348	13	50	0	1439	347	0	0
	Landslide	159	1461	22	617	1540	123	5	0
	Lightening	31	57	214	0	0	0	0	0
	Mudslide	22	19	0	0	298	0	0	0
	Other	1	0	0	0	0	0	0	0
	Rains	8	0	0	0	12	0	0	0
	Rainstorm	40	8	0	0	512	0	0	0
	Storm	89	0	72	0	727	144	0	0
	Thunderstorm	3	0	0	0	0	0	0	0
	Windstorm	8	0	0	0	50	16	0	0
Ethiopia (2010 – 12)	Building Slide	1	0	0	0	0	0	3	0
	Drought	1285	0	0	0	0	0	18032935	0
	Fire	159	0	0	0	0	0	321	0
	Flood	316	25	0	0	246	85	1959402	0
	Hailstorm	2	0	0	0	0	0	0	0
	Landslide	7	49	0	0	0	0	16508	0
	Plague	899	0	0	0	0	0	0	0
	Rain	2	0	0	0	0	0	0	0

Drawn from DesInventar data

4.0 Data on disaster losses in urban areas of SSA

The lack of sub-national details on EM-DAT is quite a limiting feature as far as interest in urban disasters is concerned. The data from DesInventar, however, provides more sub-national depth with information broken down into sub-districts. While it is not immediately possible from the DesInventar database to understand if the event has occurred in an urban area, it is possible to cross-reference the names of the districts/sub-districts in DesInventar with data on population for major urban centres from another data source (www.citypopulation.de). With this cross-referenced information it is possible to determine which sub-districts in DesInventar are 100% urban and thus make some analysis. This is of course based on the assumption that the district was a homogenous or predominately urban space.

The 2015 UNISDR Global Assessment Report (UNISDR 2015) analysed sub-regional data across the 89 national datasets in DesInventar, including the 15 SSA countries[7]. For most of these countries, it is possible to infer that some of this analysis is of "urban data" because the events occurred in a sub-regional that is almost entirely urbanised. Thus we present below an analysis from a selection of large cities, including Urban ARK case study cities Nairobi (Kenya), Niamey (Niger), Dakar (Senegal), plus Kampala (Uganda) and Freetown (Sierra Leone). It would be possible to extend this analysis to other major cities for the countries included in DesInventar, as there is data available to be analysed, although it requires cross-referencing with the urban population data, with Google maps and with local knowledge. This could yield some possibly interesting results but it was beyond the scope of this research.

[7] see http://www.desinventar.net/index_www.html

Before proceeding further, a note needs to be made about the quality of the "urban" datasets available in DesInventar. Overall the data for most of the urban areas is not of sufficient quality to reliably make conclusions about the totality of disaster losses in a particular urban area, but it does give an overview about the city and the kinds that are prevalent. Often data is entered for one year and not others. Commonly, lots of entries exist for certain kinds of events (i.e. fires or traffic accidents or floods) but not for other kinds of events. This depends on where the data comes from and who is responsible for upkeep of the dataset. One gets the impression that events are still vastly unreported, so the actual extent of losses is much greater than what is seen here. Nonetheless the analysis presents a range of the kinds of disaster events that we would expect to see in urban areas.

Kampala

For example, the data about events in Kampala shows the kinds of events we would expect to see in an urban area (Figure 2 below). The District of Kampala, Uganda has a 100% urbanisation level based on a comparison of the population of the capital city Kampala, so it is possible to infer that all of the events listed in DesInventar under "Kampala district" have happened in an urban area.

The types of disasters affecting the population between 1995 and 2013 were reported to be accidents, fire, flood and disease epidemics, lightening, rains, structural collapse and storm. Out of the total number of deaths reported, 97% were caused by accidents[8]. Fire caused 63% of the housing damage/destroyed and flooding caused 36%. In terms of number of people affected by disasters, flooding was by far the greatest, accounting for 95% of the people affected. However, the database accounts for only 67,529 people affected by flooding over the period, which in a city of population approximately 1.5 million means that according to the database only 4.5% of the population was affected by flooding, which seems low considering that flooding is common is Kampala during the rainy seasons. There is no data on the economics losses from these events (see Table 2)

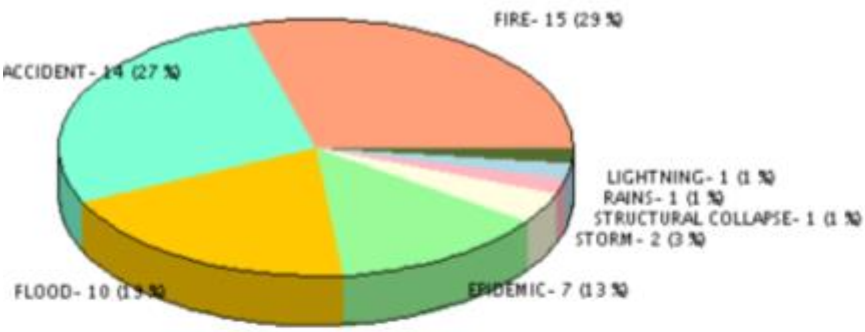


Figure 2: Entries of disaster events (datacards) in Kampala District from 1995-2013 (source: www.desinventar.net)

[8]These are largely police reports of traffic accidents amalgamated and entered as one data entry by year. From one entry of the database: "Total accidents reported in the year was 9558. There were 524 Government Vehicles, 14984 civilian vehicles, 1676 motor cycles, 849 ped/cycle, 2266 Pedestrian, 79 Forestry M/V, 100 Police M/V, 32 army Vehicles, 1 Prison Vehicles, 131 Diplomatic Vehicles and 16 U/Registered. 5058 of the accidents occurred during day and 4500, at night"

Table 5: Losses by disaster type in Kampala District 1995-2010 (Source: www.desinventar.net)

Event	DataCards	Deaths	Injured	Missing	Houses Destroyed	Houses Damaged	Affected	Relocated	Evacuated	Losses $USD	Losses $Local	Education centers	Hospitals	Damages in crops Ha.	Lost Cattle	Damages in roads Mts
ACCIDENT	14	4452	17013	0	0	0	0	0	0	0	0	0	0	0	0	0
EPIDEMIC	7	36	0	0	0	0	787	0	0	0	0	0	0	0	0	0
FIRE	15	7	27	0	212	0	2040	0	0	0	0	1	0	0	0	0
FLOOD	10	37	0	2	122	0	67529	0	0	0	0	2	0	0	0	41
LIGHTNING	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RAINS	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
STORM	2	0	0	0	0	0	184	0	0	0	0	0	0	0	0	0
STRUCTURAL COLLAPSE	1	12	183	0	0	0	0	0	0	0	0	0	0	0	0	0

Nairobi

In Kenya, the Nairobi District which is also 100% urbanised was found to have documented incidents of flooding, drought and disease epidemics (see Figure 3 below). However there is only sporadic reporting, with 52 entries across four years only (2002, 2009, 2010 and 2012). From the reports, 46% of deaths were caused by flooding and 53% by epidemics. The kinds of epidemics cited are cholera outbreaks and swine flu, predominantly. Flooding caused all of the reported housing damage/destruction. From the data it can be seen that both flooding and disease epidemics are a problem in Nairobi. However, the database lacks data for many of the years and it does not seem to record any entries for fires or accidents, which we would expect to see in a city of over 3 million people.

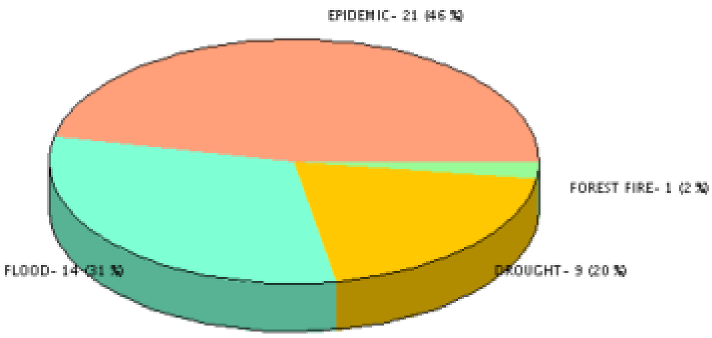


Figure 3: Entries of disaster events (data cards) in Nairobi county from 2001-2013 (source: ww.desinventar.net)

Table 6: Losses by disaster type in Nairobi District 2002-2013 (source: ww.desinventar.net)

Event	DataCards	Deaths	Injured	Missing	Houses Destroyed	Houses Damaged	Affected	Relocated	Evacuated	Losses $USD	Losses $Local	Education centers	Hospitals	Damages in crops Ha.	Lost Cattle	Damages in roads Mts
DROUGHT	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EPIDEMIC	21	22	0	0	0	0	120	0	0	0	0	0	0	0	0	0
FLOOD	21	30	5	1	60	333	100	0	0	0	0	0	0	0	0	0
FOREST FIRE	1	0	0	0	0	0	0	0	0	0	250000	0	0	50	0	0

Niamey

In Niger, the capital city of Niamey, has a population of 978,029, according to the census in 2012. The Niamey region, which is what is reported on in DesInventar, has a population 1,026,848 according to the census, thus 95% of the population is living within the city boundaries, which makes it perhaps useful to analyse. Data entries for every year between 2000 and 2013 show that epidemics and floods are the prevailing disasters in Niamey. Epidemics caused 99% of the 968 reported deaths. There is quite detailed reporting of epidemics, with 96 entries indicated and mostly measles and some meningitis outbreaks. For example, 5469 cases of measles, resulting in 161 deaths was reported on 21 April 2004. Fifty-one floods were reported across years of 2000, 2006, 2010, 2013, including 34 incidents of flooding in 2013 ranging is size from 0-932 houses destroyed.

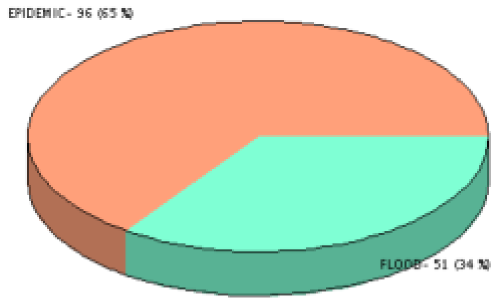


Figure 4: Entries of disaster events (data cards) in Niamey district from 2000-2013 (source: www.desinventar.net)

Table 7: Losses by disaster type in Niamey, 2000-2013 (source: www.desinventar.net)

Event	DataCards	Deaths	Injured	Missing	Houses Destroyed	Houses Damaged	Affected	Relocated	Evacuated	Losses $USD	Losses $Local	Education centers	Hospitals	Damages in crops Ha.	Lost Cattle	Damages in roads Mts
EPIDEMIC	96	968	0	0	0	0	26302	0	0	0	0	0	0	0	0	0
FLOOD	51	4	6	0	13039	473	13810	0	0	0	0	0	0	193	73	0

Dakar

The synthesized data on Dakar region includes data from four departments, including Dakar, Guédiawaye, Pikine, and Rufisque. The former three areas are considered urban and the latter rural. There are a total of 4281 entries for the urban areas and 421 entries for the rural area, thus 91% of the entries are for the urban areas. While there are a few entries that go as far back as 1989, the database becomes more populated as of 2002. Road accidents are overwhelming the largest number of entries, totalling 82% of all events. Fires, drowning, structural collapse, industrial disasters and flooding are also prevalent. Drowning caused 441 deaths, road accidents caused 257 deaths and industrial disasters caused 147 deaths (in two incidents). Flooding accounted for 99% of all housing damages and destruction and 98% of all those affected by events. Over 390,000 people were recorded as being affected by flooding, accounting for 12% of the total population of the region.

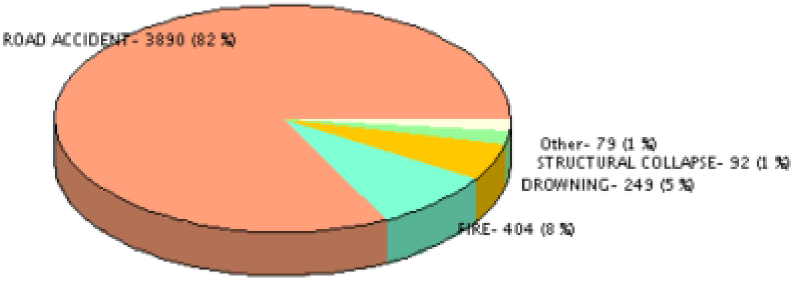


Figure 5: Entries of disaster events (data cards) in Dakar from 1989-2015 (source: www.desinventar.net)

Event	DataCards	Deaths	Injured	Missing	Houses Destroyed	Houses Damaged	Affected	Relocated	Evacuated	Losses $USD	Losses $Local	Education centers	Hospitals	Damages in crops Ha.	Lost Cattle	Damages in roads Mts
COASTAL EROSION	1	0	2	0	0	0	0	0	0	400000	0	0	0	0	0	0
DROWNING	249	441	56	14	0	0	0	0	0	0	0	0	0	0	0	0
EPIDEMIC	8	0	0	0	0	0	599	0	0	0	0	0	0	0	0	0
FIRE	404	33	40	0	21	169	1800	0	0	4463906	666	6	3	0	0	0
FLOOD	47	19	7	0	3	63862	390239	319	0	0	400000	0	0	0	0	0
INDUSTRIAL DISASTER	2	147	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LOCUST	2	0	0	0	0	0	915	0	0	0	0	0	0	0	0	0
ROAD ACCIDENT	3890	257	5619	0	0	2	0	0	0	0	0	0	0	43	0	0
SINKING	4	10	4	0	0	0	0	0	2	0	0	0	0	0	0	0
STORM	2	0	0	1	0	0	0	0	7	0	0	0	0	0	0	0
STRONG WIND	7	2	0	9	0	0	0	0	52	0	0	0	0	0	0	0
STRUCTURAL COLLAPSE	92	36	301	0	9	49	0	0	0	0	0	6	0	0	0	0
SWELL	1	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0
WILD FIRE	5	0	0	0	0	0	0	0	0	0	0	0	0	48	0	0

Freetown

The database on the Western Area, Sierra Leone includes the capital, Freetown as well as the Western Rural Area. There are 324 datacards for the Western Area, including 34 for the rural area and 290 for Freetown, thus 90% of entries are for the urban area of Freetown. The kinds of events include fires, maritime accidents, floods, road accidents, epidemics, landslides and structural collapse. The database has entries from 2006, and then 2009-2014. Deaths are attributed to all of kinds of events, although maritime accidents (235 deaths), road accidents (174 deaths) and epidemics (215 deaths) are the most prevalent, accounting for 79% of all deaths recorded in the database. Fire accounts for 83% of all the houses destroyed/damaged and flooding for 7%. The amount of losses from maritime accidents and fires is notable in this database.

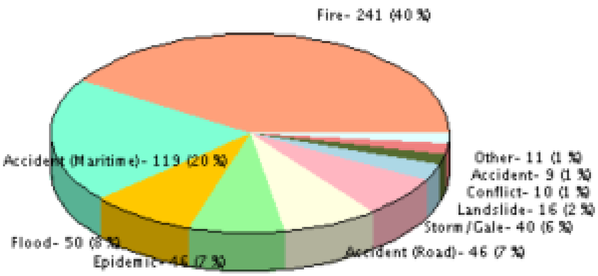


Figure 6: Entries of disaster events (data cards) in Western Area, Sierra Leone from 2006, 2009-2014 (source: www.desinventar.net)

Event	DataCards	Deaths	Injured	Missing	Houses Destroyed	Houses Damaged	Affected	Relocated	Evacuated	Losses $USD	Losses $Local	Education centers	Hospitals	Damages in crops Ha.	Lost Cattle	Damages in roads Mts
Accident	9	9	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Accident (Maritime)	119	235	52	0	0	0	3982	0	0	0	0	0	0	0	0	0
Accident (Road)	46	174	200	0	4	3	5	0	0	0	0	0	0	0	0	0
Conflict	10	1	47	0	10	4	1000	0	0	0	0	0	0	0	0	0
Drought	2	0	0	0	0	0	500	0	0	0	0	0	0	0	0	0
Drowning	2	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epidemic	46	215	39	0	0	0	1117	0	0	0	0	0	0	0	0	0
Fire	241	30	233	0	1338	457	10546	0	0	0	0	0	0	0	0	0
Flood	50	27	29	0	310	0	2308	0	0	0	0	0	0	0	0	0
Landslide	16	57	50	0	20	0	99	0	0	0	0	0	0	0	0	0
Lightning/Electrical Storm	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Storm/Gale	40	14	69	0	944	654	5559	0	0	0	0	0	0	0	0	0
Structural Collapse	5	5	10	0	0	1	0	0	0	0	0	0	0	0	0	0

Results

The results from Kampala, Nairobi, Niamey, Dakar and Freetown suggests that the major losses in urban disasters in Africa were from flooding, epidemics, fires, and accidents, and to a smaller extent structural collapse, industrial disasters, drowning, storms.

The major causes of death are road and maritime accidents (70%) and epidemics (17%) and drowning (6%), see Table 5. In terms of houses destroyed or damaged, flooding is by far the most prevalent, although fires and storms are also causing losses.

Table 8: Deaths from disaster events in urban areas, according to DesInventar.

Type of event/ City	Kampala	Nairobi	Niamey	Dakar	Freetown	**Total**
Accident (road or maritime)	4452	-	-	267	418	**5137**
Epidemic	36	22	968	0	215	**1241**
Drowning	-	-	-	441	7	**448**
Industrial disaster	-	-	-	147	-	**147**
Flood	37	30	4	19	27	**117**
Fire	7	-	-	33	30	**70**
Landslide	-	-	-	-	57	**57**
Structural collapse	12	-	-	36	5	**53**
Storm	1	-	-	2	19	**22**
Other	-	0	-	0	1	**1**
Total	4545	52	972	945	779	7293

Table 9: Houses destroyed or damaged in urban areas, according to DesInventar

Type of event/ City	Kampala	Nairobi	Niamey	Dakar	Freetown	**Total**
Flood	122	373	13039	454101	310	**467945**
Fire	212	-	-	190	1793	**2195**
Storm	1	-	-	0	1788	**1789**
Structural collapse	-	-	-	58	1	**59**
Landslide	-	-	-	-	20	**20**

Other	0	-	-	2	21	**23**
Total	335	373	13039	454351	3933	472301

This analysis of DesInventar brings up some findings about the utility of this database for understanding disaster losses in urban areas of SSA:

- The methodology of DesInventar is very useful for understanding a range of different kinds of disaster events that are typical in urban areas and it also picks up very small-scale events (for example a house fire or an accident). It is easy to imagine, that if a good level of data was reported in the database that it would provide a very telling picture about the extent of losses to a range of types of events within different areas of the city.
- DesInventar provides a general idea of the subnational distribution of disasters, but it is still not possible to make accurate conclusions about any of the cities given the lack of consistency of the data. Some kinds of events are reported in detail, whereas other kinds of events are not reported at all. Any attempt to draw conclusions, based on the existing data, would be tenuous in light of the assumptions and potential errors at play. The cities analysed here all show quite different events and levels of losses. Some of this variability comes from the differences across the cities, for example, maritime accidents are a major loss of life in Freetown and measles is prevalent in Niamey. However, we assume that much of the variation is due to a lack of comprehensive data. For example, some of the urban areas have good reporting on fires, accidents or epidemics and some do not. As said before, the data gives the impression that still most of the events are going unreported.
- DesInventar does not usually report on "everyday" human losses related to endemic conditions caused by environmental factors, such deaths from diarrhoeal disease (unless it is classified as an outbreak, such as cholera), malaria or deaths resulting from a lack of medical attention and morbidity. It is this everyday risks and health perspective that Urban ARK intends to pick up on, thus extending the range of analysis about human losses to include those related Satterthwaite (2015c) suggests to introduce an Urban ARK classification of 'small disasters' and 'everyday disasters' which would lead to a more comprehensive accounting of extensive risk losses.

The next section of this paper turns to look at what kinds of information are available from the health sector that could shed more light on human losses in urban areas of SSA. As mentioned earlier, it is the accumulation of these extensive every day human losses that accumulate and lead to bigger losses as compared to large disasters.

5.0 Data on health impacts in urban SSA

Losses from disease outbreaks and epidemics in SSA have been studied and document by the WHO and in various Demographic and Health Surveys (DHS) programme under the USAID at the national and regional levels. The available data shows the high prevalence of infectious diseases and ailments (eg. respiratory diseases) that can be predicated by environmental factors especially within urban centres (See figures 4 – 5 below). For instance in 2004, infectious and parasitic diseases in the region accounted for an average of 43.2 % deaths (figure 4 below). The figure is significantly higher above the median mark (at 56%) when the average numbers of deaths by respiratory infections is also considered. This is an indication of significant losses from diseases that may be influenced by environmental factors within populations, especially those that are urbanised.

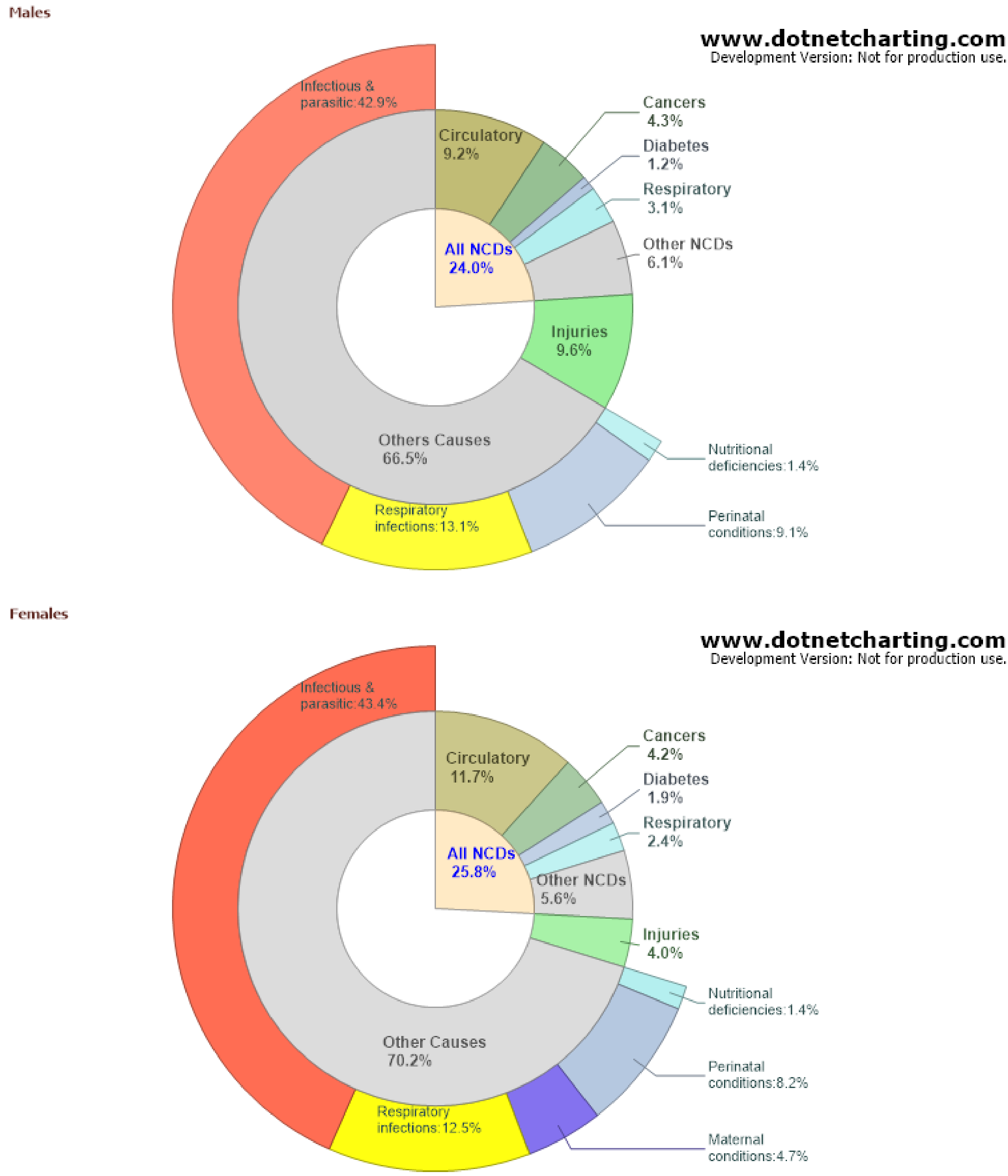
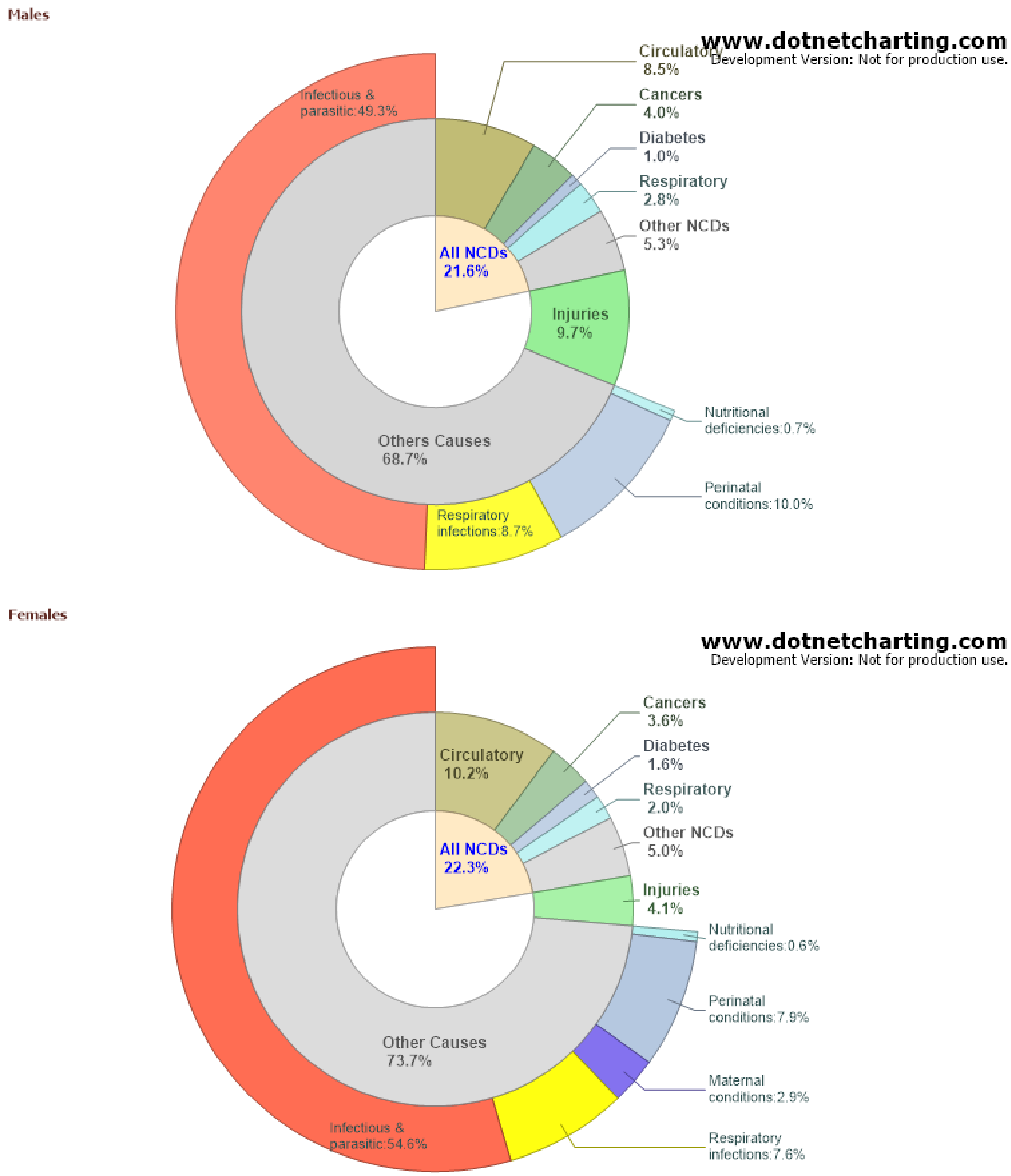


Figure 7: Disease prevalence and percentage of mortality for males and females in Africa (Source: WHO, 2004)

There were similar distribution in individual SSA countries. For instance the mortality distribution for Kenya (also in 2004) is reproduced in Figure 5 below. Kenya reported an average of 52% mortality from infectious and parasitic diseases.

Figure 8: Disease prevalence and percentage of mortality for males and females in Kenya (2004)



Source: WHO

Taking a detailed look into the prevalence of disease epidemics, the global distribution of recent cholera cases reported between 2010 and 2013, revealed that there was a majority of the reports coming from SSA (Figure 6 below). And an even more detailed look at a sample of six countries (Kenya, Malawi, Niger, Nigeria, Senegal and Uganda) showed that there had been a total of 3,278 reported cases (Table 3 below). The data on the number of reported number of deaths in these six countries within the 3-year period was incomplete however a comparison between the data that was available in both categories showed that there was an average loss of 28 deaths per documented outbreak of cholera.

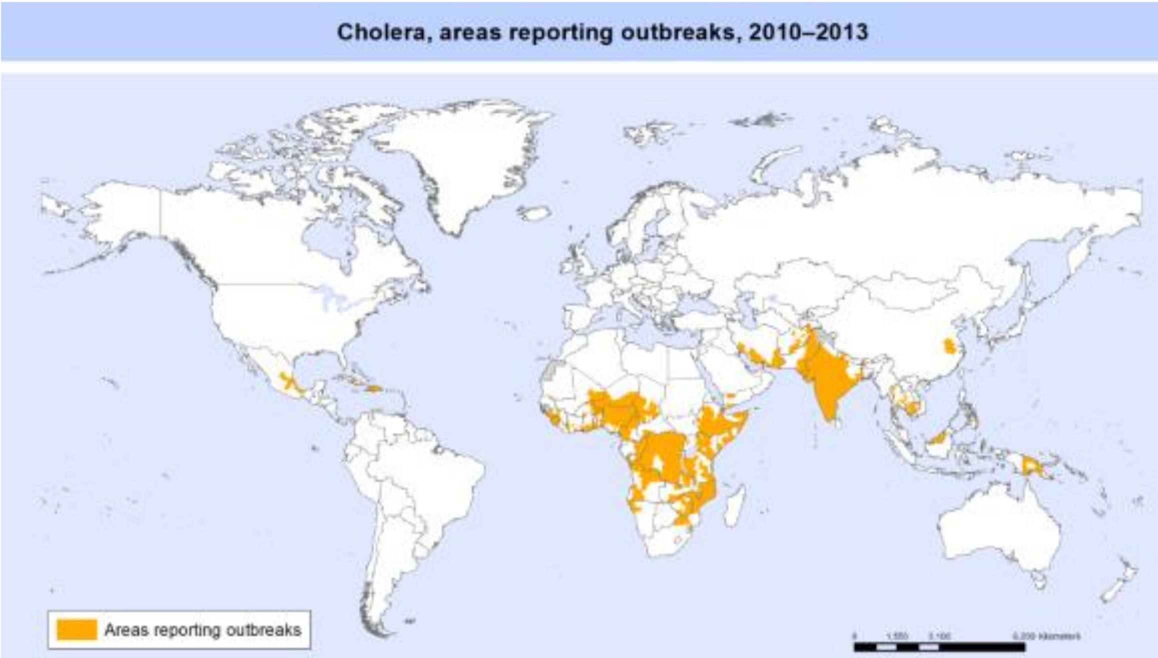


Figure 9: Global distribution of cholera outbreaks 2010-2013 Source: WHO (2014)

Table 10: Number of cases and deaths from cholera outbreaks in select SSA countries 2010-2013

Country	Year	Number of cases	Number of reported deaths from cholera
Kenya	2011	2	74
Kenya	2010	63	3188
Malawi	2012	2	-
Malawi	2011	4	120
Malawi	2010	17	1155
Niger	2013	13	-
Niger	2012	110	-
Niger	2011	60	2324
Niger	2010	66	1154
Nigeria	2013	229	-
Nigeria	2012	18	-
Nigeria	2011	742	23377
Nigeria	2010	1712	44456
Senegal	2012	0	-
Senegal	2010	0	-
Uganda	2013	27	3
Uganda	2012	135	-
Uganda	2010	78	2341

Source: WHO

What remains a challenge yet again is the lack of proper disaggregation of data to specifically cover urbanised cases, but it is very interesting to see how the conclusions from DesInventar (the analysis of district level data, with that from www.citypopulation.de) indicated the disease epidemics were an urban problem for the Nairobi District in Kenya (54% - see figure 3 above). And how that DesInventar analysis has an apparent strong correlation in terms of proportionality, to the mortality caused by disease epidemics in Kenya in 2004 from the WHO data (which falls within the period of the data used by DesInventar). It would be problematic to make any strong claims beyond the interesting observation of an apparent positive correlation, and how the national disease epidemic problem, was very much an urban problem (or tentatively vice-versa).

Another example of major health losses in SSA is from the prevalence of malaria. The complex factors contributing to malaria risk in urban areas are not fully understood but there is evidence that the urban poor are at significant high risk from malaria (Donnelley et al, 2005)[9] and there was generally a positive correlation between malaria prevalence and the environmental conditions of households, showing a strong correlation for households surrounded in filth and improper waste and sewerage channels (Nkuo-Akenji et al, 2006). In Dar es Salaam, for example, de Castro et al. (2004) found that a large number of breeding sites for the anopheles mosquito were concentrated in lower elevation parts of the city or near drains that require cleaning or rehabilitation, and that entomologic inoculation rates (i.e. the number of infective bites per person per year) were likely to be significantly higher in informal settlements and marginal localities near the periphery. From WHO records, there were an estimated 627,000 malaria deaths worldwide in 2012 (uncertainty interval, 473 000–789 000), and out of this estimate, most occurred in sub-Saharan Africa (90%).

Although SSA shares the greater burden of infectious and parasitic diseases, such as malaria and other endemic conditions, the losses may not be categorised as "events" in disaster databases because they occur regularly.

The WHO regional office for Africa publishes the African Health Observatory, which provides very useful and comprehensive data and statistics on disease prevalence and burden across the Africa region. The information is reported at the country level, and some of data is separated into rural and urban, but it is not possible to derive details of particular urban areas[10]. The Demographic and Health Surveys (DHS) programme also provide data for urban and rural areas across most African countries and with access to the dataset one can analyse the indicators for urban areas in a country[11].

WHO introduces an interesting dimension of losses, which provides more depth into the conceptualisation of losses from disease prevalence. The measure is termed as the Disability-adjusted life years (DALYs), which is a summary of the population health that combines the years of life lost as a result of premature death and the years lived with a disease (WHO, 2012). It gives a more detailed appreciation into how diseases that may not result in death have significant impact on the livelihoods

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[9] Data presented from studies in a number of sub-Saharan African cities (Brazzaville, Congo; Dakar, Senegal; Abidjan, Cote d'Ivoire; Cotonou, Benin; Ouagadougou, Burkina Faso; Dar es Salaam, Tanzania, and Accra and Kumasi, Ghana) showed clearly that malaria is a considerable urban health problem in Africa (Donnelley et al, 2005).

[10] See the latest 2014 Atlas of Health Statistics http://www.aho.afro.who.int/sites/default/files/publications/921/AFRO-Statistical_Factsheet.pdf (last accessed 15/12/15).

[11] https://dhsprogram.com

and productivity of its sufferers. Table 7 below, gives a breakdown of the mortality burden of diseases attributed to water, sanitation and hygiene, and shows that the losses in a DALYs measure is significantly high. For instance in Kenya, there were recorded relative losses of 31.3 deaths per 100,000 population in 2012 from water, sanitation and hygiene diseases. However, the DALYs measure for the same period showed an average loss of 2,324 per 100,000 population.

Table 11: Mortality and burden of disease attributable to water, sanitation and hygiene (Data source: WHO, 2012[12])

	Inadequate water, sanitation and hygiene					
	Deaths total*i*	Deaths, children aged under 5 years*i*	Deaths per 100 000 population*i*	Disability-adjusted life years (DALYs) total (000s)*i*	Disability-adjusted life years (DALYs), children aged under 5 years (000s)*i*	Disability-adjusted life years (DALYs) per 100 000 population*i*
Country	2012	2012	2012	2012	2012	2012
Kenya	13496.9 [8529.9-17817.6]	6433.5	31.3	1003.4 [634.2-1324.7]	612.8	2,324
Malawi	4008 [2521.1-5259.6]	1935.9	25.2	290.5 [182.7-381.2]	188.2	1,826
Niger	11081.2 [7438.5-13882.7]	7198	64.6	864.2 [580.1-1082.6]	672.3	5,037
Nigeria	80967.8 [53908.2-103325.6]	50114	48	6549.3 [4360.5-8357.8]	4692.1	3,879
Senegal	3481.8 [2186.9-4598.2]	1176.8	25.4	222.3 [139.6-293.6]	117.9	1,619
Uganda	10816.4 [6638-14179.1]	5250.7	29.8	844.2 [518.1-1106.6]	507.8	2,323

The DALYs measure has recently been adapted and used to the impact of disaster and it promises to provide a view into a dimension of losses that is not accounted for by the focus on mortality, morbidity or damage to houses and infrastructure (Noy, 2015). Using DALYs for disasters, aims at accounting for the impact of disasters on human welfare more generally, including the impact through infrastructure and capital destruction (Noy, 2015)[13]. Major disasters can cause significant amount of lost life years to accumulate in one country, and the losses are higher in low and middle income countries (typical to SSA) than in high-income countries (UNISDR, 2015).

The application of this novel DALYs measure of disaster losses, gives an indication of the long-term effects of disasters and the potential of using it to better understand the effects of extensive risk in SSA could be explored further.

A growing number of detailed case studies have contributed to a better understanding of vulnerability factors, such as how high poverty levels, characterised by poor living and working conditions in and around the home, account for greater disease burdens and exposure to other risks in urban informal settlements (for a review, see Sverdlik, 2011). At the national level, data from the DHS Programme

[12] http://www.who.int/gho/phe/water_sanitation/burden/en/ (check reference)

[13] Lifeyears lost due to mortality are calculated as the difference between the age at death and life expectancy. The cost in lifeyears associated with the people who were injured (or otherwise affected by the disaster) is assumed to be defined as a function of the degree of disability associated with being affected, multiplied by the duration of this disability (until an affected person returns to normality), times the number of people affected. This disability coefficient is the 'welfare-reduction weight' that is associated with being exposed to a disaster. Calculations here are based on a disability coefficient defined by the World Health Organization as "generic uncomplicated disease: anxiety about diagnosis" (e=0.054) and a three-year horizon for return to normality.

shows the relative high proportion of the population living without improved water sources or improved toilet facilities between 2008 and 2012, in six selected SSA countries (see Table 8). The high proportion recorded for these household conditions gives an indication into everyday risk factors (especially for health) that the population is exposed to. Niger, for instance in 2012, had a very high proportion (81.3%) of households living with unimproved toilet facilities, and 72.7% of households living without toilet facilities.

Table 12: Sample health survey data for select SSA countries 2008-2012

Country	**Survey**	**Under-five mortality rate (per 1000)**	**Malaria prevalence according to RDT (%)**	**HIV prevalence among general population (%)15-49**	**Households using an unimproved water source (%)**	**Households with an unimproved toilet facility (%)**	**Households using no toilet facility (%)**
Kenya	2008-09 DHS	74	-	6.3 (CI: 5.3 - 7.3)	35.5	51.4	12.1
Malawi	2010 DHS	112	-	10.6 (CI: 9.6 - 11.6)	20.1	88.4	10.8
Niger	2012 DHS	127	-	0.4 (CI: 0.2 - 0.5)	32.9	81.3	72.7
Nigeria	2010 MIS	143	51.5		46.1	57.5	33.9
Senegal	2010-11 DHS	72	2.7	0.7 (CI: 0.5 - 0.9)	19.5	39.8	17.7
Uganda	2011 AIS	-	-	7.3 (CI: 6.7 - 7.9)	26.6	63.3	9.4

Source: DHS (www.dhsprogram.com).

A number of case studies of small towns in Nigeria, Uganda and Kenya as well as in Tanzania and Cameroon suggest that levels of provision for water, sanitation and waste collection are often much lower than in larger urban centres (Hardoy et al., 2001: 143-35; see also UN-Habitat 2006: 36). Almost none of the populations in the six small towns and three small cities studied had access to piped water connections and public sanitation. These deficits suggest that everyday risk factors for health may be considerably higher in small urban centres, although it is the environmental problems of large cities that attract most attention in the health and demography literature (McGranahan, 1999; Montgomery 2006; WaterAid, 2010). There is thus a clear need to better understand how everyday risk factors for health vary both at the intra-urban and inter-urban scales, and how urbanisation dynamics in SSA are shaping this.

One of the few detailed urban studies on health and population dynamics conducted in Nairobi, Kenya, showed that in 2012, the urban poor in Nairobi ("Slum residents") sampled from a cross-section of slums, were generally disadvantaged in comparison to the rest of Nairobi and Kenya (APHRC, 2014). For instance, the lack of good drinking water and poor drainage were cited as the major needs for the slum residents (as highlighted in sample DHS general country data above). The study also found that access to good water was a problem for one-in-five slum residents in Nairobi (APHRC, 2014). The health risks and subsequent losses in the studied urban slums were on occasion even higher than those of rural Kenya. For instance Child mortality and under-5 mortality rates in the urban slums were higher than the rates in rural Kenya, and Kenya as a whole (APHRC, 2014)[14]. The usefulness of the Nairobi slum studies, are the disaggregated nature of the data and shows other interesting demographics of the sampled populations (such as the subdivisions of the urban area, age, ethnic group, etc) that helps to understand the depth of urban health risk and disease burden. Again the methodology employed allows for an appreciation of not only the actual health risks but gathers significant background information (on households and the population) that are underlying these risks.

The lesson and challenge for Urban ARK, and disaster researchers working on SSA, from this example of the APHRC studies would be to produce comprehensive data to cover the broad range of risks (including the health) and other extensive everyday risks that urban populations in the study sites face, with sufficient background data that enables for a broader knowledge of the risks and as far as possible the underlying factors that account for them.

6.0 Quantified cases of urban losses

Data about disaster losses in urban SSA is also available from databases, which hold information about large-scale disaster events, such as GliDE, ReleifWeb and Dartmouth Flood Observatory and other information sources. These databases provide descriptive information about a disaster such as its location (from this it is possible to determine if the disaster has happened in an urban area), duration, how many people are affected, losses and relief activities. The Dartmouth *Global Active Archive of Large Flood Events* also gives natural hazard information, such as extent of flood and height of water.

These sources of information serve as potential sources of secondary data that can be collated and analysed to provide further detail on urban disasters losses and the nature of risks.

The summary table below is compiled from sampled case studies and reports that provide some detail of urban losses and damage. The detailed urban disaster accounts have been compiled from cited cased of Post Disaster Needs Assessments (PDNA) from World Bank reports, International disaster relief agency reports and, humanitarian and disaster information portal; 'Relief web'(see details in Annex 1).

Table 13: Recent quantified losses from disasters in select SSA countries

Date	Country	City	Disaster	No. Affected	Fatalities	Economic losses ($m)	Damages ($m)	Reported dimension of losses
2009	CAR	Bangui	Flood	14,500	NR	2.6	6m	- Housing - Commercial
2009	Senegal	Dakar	Flood	360,000	NR	46	58	-Housing Infrastructure -Health

[14] This trend was similar to surveys and studies conducted in 2000, where Under-5 and infant mortality rates in Nairobi's slums were about 20 and 35 %, respectively, higher in the slum communities of Nairobi compared to rural Kenya. AHPRC (2012) Urban Health in Kenya Key Findings: The 2000 Nairobi Cross-Sectional Slum Survey. Fact Sheet. http://aphrc.org/wp-content/uploads/2014/10/Urban-Health-in-Kenya_Key-Findings_2000-Nairobi-Cross-sectional-Slum-Survey.pdf (last Accessed 16/12/15).

2009	Burkina Faso	Ouagadougu	Flood	150,000	NR	33	102	-Housing -Infrastructure -Health
2010	Zambia	Lusaka	Flood	1,200	87	NR	NR	-Human life -Health (3381 cholera cases)
2010	Togo	Lome	Flood	5000	NR	NR	NR	-Health -Housing
2015	Guinea	Conakry	Flood	*4925	NR	NR	NR	-Housing
2015	Ghana	Accra	Flood	44,370	200	NR	NR	-Human life -Housing

* households

7.0 Other databases and data sources

As this paper has shown, there are different kinds of information that are available that could potentially help to paint a picture about the nature and scale of disaster and health related losses in urban areas in SSA. Table 12 (see below) summarises several databases that capture the losses associated with everyday hazards, and small and large disasters at different scales[15].

National databases

Vital Registration Systems collect data on births and deaths from individual statistical reports. However, they are rarely linked to population registers – which combine different sources of data, including from censuses and Demographic and Health Surveys, etc. – for countries or urban and rural and areas, nor are they up to date in many low- and middle-income countries (UN 2014). As a consequence, comprehensive current information on the demographic characteristics and health outcomes for each resident of a given country is often unavailable.

Sub-national databases

Demographic and disease surveillance systems can help to fill this gap through collecting data on disease burdens and their distribution for small geographic units (e.g. neighbourhood, town, city, district, etc.) (Nkuchia et al., 2015: 3). Such systems provide a critical foundation for disease prevention and control, but seldom exist in lower-income countries/towns or cities, with the notable exception of Nairobi (Emina et al., 2011).

Urban Health Observatories (UHOs) also monitor heath and its determinants at the intra-urban scale by collecting and compiling secondary data from censuses and Demographic and Health Surveys, among other data sources, and by analysing this data using remote sensing and GIS mapping. UHOs

[15] Urban ARK researchers have created a database of data sources relevant to understand risk in SSA, which can be accessed from here http://tinyurl.com/africa-datasets. These data sources provide information on all three of the ways of understanding risks identified in figure 1 (losses, vulnerability and natural/technological hazards).

aim to provide urban policymakers with detailed data and maps showing the social and spatial distribution of disease burdens as a basis for informing targeted investment in deprived urban localities. Several pioneering cities, such as Belo Horizonte, Brazil (see Vlahov et al., 2011), have developed UHOs, but few exist (or have been documented) in SSA.

Household/individual databases

Hospital episode data provide details of the individual admitted, where they were admitted, and the diagnoses made. However, details about where the individual admitted lives or where their health was affected are seldom recorded. This makes it difficult to examine the potential links between environmental factors and particular health outcomes.

Hospital admission and mortality counts can be used to show temporal trends associated with exposure to different seasonal or climatic conditions in the short- or long-term, which could be of potential use for urban research and policy on climate change adaptation (Scovronick et al., 2015). Hospital data could also be cross-referenced with particular disaster events to examine the number of people whose health may have been affected, which could be of potential use for Urban ARK.

Event-specific databases

Numerous data sources collect event-specific information on particular disaster hazards (e.g. floods, earthquakes, technological disasters, etc.) and everyday hazards. Data sources on the former are listed in Table 12 and are relatively straightforward. Data sources on the latter include police reports on crime specific events (e.g. homicide, assault) and accident specific events (e.g. road traffic accidents). Data on road traffic accidents at the national level make international comparisons possible, as demonstrated by the WHO global observatory[16], although this data is not at a fine enough scale to permit sub-national analysis.

Newspaper records collect varied information on newsworthy events, including crime and violence, road traffic accidents, and disasters and their effects (e.g. number of people killed or displaced, number of buildings damaged or destroyed, etc.). However, newspapers tend to cover events that warrant media attention, thus excluding smaller everyday events (e.g. localised disease burdens). Their archival value as a long-term secondary source may be limited by the priority to provide timely and accurate reporting of events as well (Yzaguirre et al., 2015).

[16] http://www.who.int/violence_injury_prevention/road_traffic/en/

8.0 Gaps in data for understanding losses in urban SSA

Several key data limitations can be summarised from the databases and data sources reviewed above.

Lack of collated datasets on disasters that can show extent of losses in urban areas

This analysis has shown that there is *some* data available about disasters, everyday risks and health-related losses in sub-Saharan Africa and that this data can shed some light on losses in urban areas. However there is still a major lack of collated data that can *accurately* show losses in urban areas. In DesInventar, many countries have yet sign onto report national datasets, and the quality of data, in terms of being able to understand the losses in a particular urban area, is still very weak. We contend that much of the data does exist (in accident records, police, fire and hospital records and news media), but it needs to be collated into databases in order to be useful for analysis, planning and policy-making.

Assimilating disasters losses and endemic health-related losses

Disasters are usually considered *episodic*, and thus there is a focus on disaster *events* as an occurrence of a particular phenomenon or losses over a period of time. As mentioned earlier in this paper, different databases assume different loss thresholds for considering an event as a 'disaster', for example EM-DAT considers 10 or deaths or 100 or more people affected/injured/homeless. DesInventar considers much smaller events—1 or more human loss or $1 or more in economic loss, and therefore is more useful for characterising the overall human and economic impacts of risks.

However, none of the disasters methodologies go so far as to consider endemic kin ds of health losses that occur everyday and are therefore not considered to be episodes or events, for example a death related to malaria or maternal health. We contend that, in order to have the full picture of losses for an urban area, we would need to understand the full range of disasters as well as everyday health impacts. The availability of this kind of information would be a powerful policy and decision-making tool. As per figure 1, of this paper, information on disaster losses should also include everyday health impacts.

Lack of disaggregated data for urban areas

Demographic and Health Surveys use aggregate data to achieve national representation, and while they do report for urban and rural areas, the data does not allow for understanding losses in a particular urban area, nor does it all shed light on health inequalities across high- and low-income areas within an urban population (Vlahov et al., 2011). DesInventar does disaggregate data enough to potentially allow one to analyse urban areas, but the coverage and consistency of data is still lacking in SSA.

As Mitlin and Satterthwaite (2013: 104) point out, the lack of disaggregated data can be partly overcome by examining census data on vulnerability factors and the determinants of health linked to housing conditions, access to basic services, space per person, cooking fuels used, protection against extreme weather, etc. This data can shed light on neighbourhoods or areas where social and vulnerability factors for disasters and everyday health are particularly high, and where investments to address these factors need to be made. The use of census data has also been promoted to assess vulnerability to climate change at the intra-urban scale (Schensul and Dodman 2013), and could be used by Urban ARK for similar purposes.

Limited spatial coverage

While DesInventar has expanded to include 15 countries in SSA, its geographic coverage remains limited in the region. Spatial coverage within SSA countries is also limited by the different ways in which 'urban' and 'rural' settlements are classified[17]. In countries where small urban centres are classified as 'rural' or as 'large villages', the proportion of damage and losses from disasters occurring in smaller centres is likely to be under-estimated. This is particularly problematic considering that disaster risk is increasing fastest in small and medium-sized urban centres where capacities to plan and manage urban growth are relatively weak (UNISDR 2011: 41).

Lack of data on the underlying drivers of risk

Most databases describe losses without exploring their underlying drivers. This requires collecting data on social factors (e.g. age, gender, income, ability, migrant status, etc.), environmental factors (e.g. access to quality housing, basic services, etc.) and political and institutional factors related to planning and decision-making processes at multiple levels (Dodman and Archer 2014). External factors linked to climate change must also be better understood in relation to internal factors linked to urban growth and change, and poverty. But information on climate change has its own limitations, and is seldom used directly for urban decision-making, as observed in Accra and Maputo (Steynor et al., 2015).

If sub-national databases become more precise and comprehensive in capturing urban loss and damage, it is highly likely that the observed trends would reinforce the view that urban risks are increasing fastest in urban areas where local governments are unable to effectively plan and manage urban growth, and are unwilling to address the needs of their low-income populations (IFRC 2010; Satterthwaite et al., 2007).

8.1 Areas of interest for Urban ARK researchers

Several areas of interest for Urban ARK researchers are identifiable from the analysis above:

- Distinguish between everyday hazards, and small and large disasters, and assess their relative importance for urban losses (especially regarding health)
- Combine different data sources (e.g. DesInventar, newspaper archives, hospital data, police reports, Demographic and Health Surveys, etc.) to create a more detailed and comprehensive picture of urban risk. Where detailed demographic and health data is lacking, consider using census data to examine underlying social and environmental risk factors within and between urban populations
- Collect disaggregated data to uncover the social and spatial distribution of urban risk within and between populations of small and intermediate urban centres and large cities

[17] Satterthwaite (2015b) discusses the problem of how 'small urban centres' are often not accounted for in major databases because the criteria that national statistical offices use to classify 'urban' and 'rural' populations – for example, settlement size, administrative importance, economic structure – often mean that small settlements are classified as 'rural' or as 'large villages' rather than as 'urban' or 'small urban centres'. This has significant implications for SSA where a large proportion of the urban population live in towns of less than 20,000 inhabitants that could be classified as either urban or rural.

- Consider using DALYs and other health metrics to uncover the significant repercussions that disease burdens often have for low-income urban populations (see Kovats et al., 2014)
- Move beyond describing loss and damage to examining the underlying social, environmental and political/institutional drivers of loss and damage. Compare how these factors differ between small and intermediate urban centres and large cities
- Learn from the experience of African cities that have implemented DesInventar and disease surveillance systems, and identify the data sources and lessons they present for developing innovative research methodologies

Table 14: Major disaster and health databases at different scales

Scale	Everyday hazards	Small disasters	Large disasters
International/ regional	WHO Global Burden of Disease indexes, including road traffic accidents by region and country http://www.who.int/gho/en/	--	- EM-DAT by the Centre for Research on the Epidemiology of Disasters (*CRED*) http://www.emdat.be/ - NatCat maintained by Munich Reinsurance Company - Global Disaster Identifier Number (GLIDE) - Disaster Database Project developed University of Richmond - Asian Disaster Reduction Centre (ADRC)
National	Demographic and Health Surveys Vital Statistics and Civil Registration Systems complied at national level	DesInventar (African coverage: Comoros, Djibouti, Ethiopia, Kenya, Madagascar, Mali, Mozambique, Morocco, Mauritius, Niger, Togo, Tunisia, Senegal, Sierra Leone, Seychelles, Uganda and Zanzibar (Tanzania))	- National databases (e.g. Australia, St. Lucia, Canada, United States, Philippines, Nepal, Sri Lanka, Orissa, etc.)

<table>
<tr><td rowspan="2">Sub-national (urban and rural)</td><td>Demographic and Health surveillance systems (DHSS)</td><td rowspan="2">DesInventar</td><td rowspan="2">--</td></tr>
<tr><td>Urban Health Observatories (UHOs)</td></tr>
<tr><td>Individual/ household</td><td colspan="3">Hospital episode data (mostly relevant to everyday hazards, but also potentially large events)

Health cards/Health passports</td></tr>
<tr><td rowspan="2">Event specific</td><td>Police records

Traffic accident records

Fire responses</td><td>DesInventar</td><td>- Earthquakes: The United States Geological Survey (USGS)
- Technological disasters: Awareness and Preparation for Emergencies on a Local Level (APELL)
- Floods: Dartmouth Flood Observatory (DFO) and United States National Weather Service (NWS)
- Tsunami: National Geophysical Data Center (NGDC)
- Industrial Accidents: Major Accident Reporting System (MARS), Major Hazard Incident Data Service (MHIDAS)</td></tr>
<tr><td>--</td><td colspan="2">Newspapers</td></tr>
</table>

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Annex 1: Definition of disaster types (Integrated Research on Disaster Risk, 2014).

Family	*Main Event*	*Peril*
Geophysical	Earthquake Mass Movement Volcanic Activity	Ash Fall Fire following EQ Ground Movement Landslide following EQ Lahar Lava Flow Liquefaction Pyroclastic Flow Tsunami
Hydrological	Flood Landslide Wave Action	Avalanche: Snow, Debris Coastal Flood Coastal Erosion Debris/Mud Flow/Rockfall Expansive Soil Flash Flood Ice Jam Flood Riverine Flood Rogue Wave Seiche Sinkhole
Meteorological	Convective Storm Extratropical Storm Extreme Temperature Fog Tropical Cyclone	Cold Wave Derecho Frost/Freeze Hail Heat Wave Lightning Rain Sandstorm/Dust storm Snow/Ice Storm Surge Tornado Wind Winter Storm/Blizzard
Climatological	Drought Glacial Lake Outburst Wildfire	Forest Fire Land fire: Brush, Bush, Pasture Subsidence
Biological	Animal Incident Disease Insect Infestation	Bacterial Disease Fungal Disease Parasitic Disease Prion Disease Viral Disease
Extraterrestrial	Impact Space Weather	Airburst Collision Energetic Particles Geomagnetic Storm Radio Disturbance Shockwave

ANNEX 2: Detailed account of cases of recent urban disasters losses in SSA

Ouagadougu, Burkina Faso: On September 1, 2009, unexpectedly high rainfall of more than 260 mm (compared to average annual precipitation between 800 and 900 mm) affected eleven of thirteen provinces. Rainfall of this magnitude had not been recorded before in Burkina Faso. More than 150,000 people in Ouagadougou were affected. Upon the request of the Government of Burkina Faso, a joint team of international experts from the World Bank, UN agencies, the EU, and national experts conducted a PDNA in November, 2009. Damages were estimated at approximately $102 million and losses at $33 million. The housing, urban infrastructure, and health sectors were most affected. Damages to buildings, particularly hospitals and schools, comprised the majority of damages in urban areas. In rural areas, small dams and irrigation infrastructure were damaged, causing relatively high losses in the agricultural sector. Reconstruction and DRR needs were estimated at $266 million (World Bank, 2010).

Dakar, Senegal: In August, 2009, severe floods caused damages in Dakar, Senegal. Schools, houses, public infrastructure, roads, and water and sanitation infrastructure were damaged or destroyed. On August 27 the national emergency plan (Plan ORSEC) was triggered. According to Government estimates, about 360,000 people were directly affected in greater Dakar, especially in the districts of Pikine and Guédiawaye, with 125,000 people directly affected in the rest of the country. The floods were mainly triggered by the lack of a functioning storm water drainage system in the metropolitan area. The heavy rainfall at the end of August was 173percent above average, with 40 millimeters of rainfall in one day. Two months after the floods, more than 800 hectares were still under water. The assessment team estimated total damages and losses of approximately $104 million. Major damages ($58 million) particularly affected the housing, health and infrastructure sectors. The overall impact on the economy, however, was relatively limited, affecting only 0.07percent of GDP. The PDNA found that recovery, reconstruction and DRR efforts required more than $232 million in total, especially for investments in the public infrastructure, water, sanitation and solid waste sectors. The assessment proposed a number of structural (investments in storm water drainage and implementation of the sanitation master plan) and non-structural measures (urban planning and improved response to disasters) to reduce flooding in Dakar and other urban areas over the long-term (World Bank, 2010).

Bangui, Central African Republic (CAR): Bangui, the capital of CAR, grew rapidly in recent decades without any structured land use and urban planning The city is situated in the natural Basin of the Oubangui River with its tributary Mpoko. Floods occur regularly in approximately fifteen percent of the urban area, particularly at the end of the rainy season. Floods are caused by high intensity rains, which cannot be rapidly evacuated and drained. In large parts of the city, drainage is inexistent or clogged due to solid waste or construction along drainage channels. The 2009 flood events in the urban area of Bangui on June 14–15 and July 3–4 left at least 14,500 people homeless, mostly women and children. Damages were estimated at $6 million, with economic losses of $2.6 million. Macroeconomic estimates suggest that the impact of this single event on GDP was limited. The housing sector was most affected in term of damages and losses, followed by the commercial sector (World Bank, 2010).

Lusaka, Zambia: 1,200 people affected by the flooding experienced at the beginning of the year 2010 in Lusaka. As a result of the flooding in Lusaka, the number of reported cholera cases increased to cumulative total 3,381 cases and 87 deaths (IFRC, 2010).

Lome, Togo: Severe flooding in Capital Lome affects 5000. ICRC (2010).

Conakry, Guinea: Between 24 July and 3 August 2015, it rained heavily in the capital of Guinea, Conakry. 4,925 households have lost their dwellings in the six prefectures and five communes1 of Conakry assessed.(Relief Web, http://reliefweb.int/report/guinea/guinea-floods-emergency-plan-action-epoa-dref-operation-n-mdrgn008).

Accra, Ghana: Torrential rains started on 3 June, 2015 and continued till the next day impacting many parts of the Greater Accra region. The floods resulted in the displacement of community populations, loss of over 200 lives and loss of property and livelihoods. Figures indicated that up to 46,370 people were affected in some way in five localities (Nima, Aworshie, Aladjo, Adabraka, Low McCarty hill). (Relief Web, http://reliefweb.int/report/ghana/ghana-floods-emergency-plan-action-epoa-mdrgh011).