

# WHO Ebola Response Laboratory coverage analysis

November 10<sup>th</sup> 2014

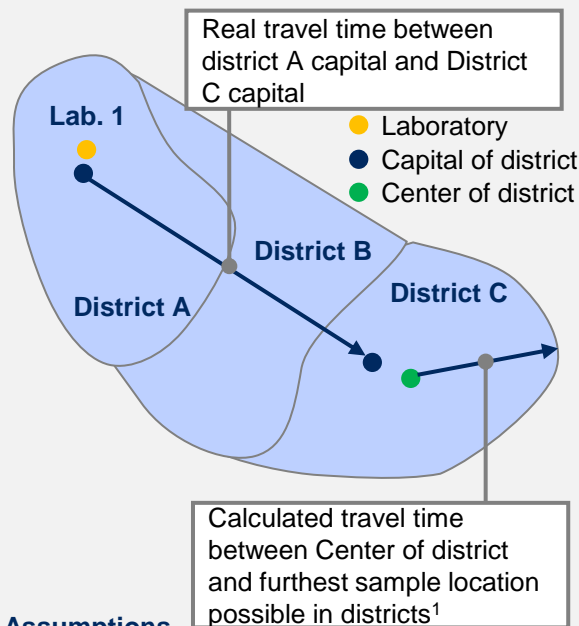
# Lab coverage analysis – Methodology

## Inputs

Data type	Data provided
<b>Field logistic data</b>	<ul style="list-style-type: none"> <li>Real travel time between the capital of each district (based on driver interview)</li> <li>Distance between districts</li> </ul>
<b>Laboratory data</b>	<ul style="list-style-type: none"> <li>Location and throughput of operational laboratories</li> <li>Location of Laboratories planned</li> </ul>
<b>Epi data</b>	<ul style="list-style-type: none"> <li>List of affected districts (cumulative confirmed + suspected case)</li> <li>Number of cases reported in last 21 days</li> </ul>
<b>Mapping data</b>	<ul style="list-style-type: none"> <li>Distance between district center and furthest location of a sample</li> <li>Area in KM<sup>2</sup> of each district</li> </ul>

## Methodology

### Travel time



### Assumptions

### Lab coverage

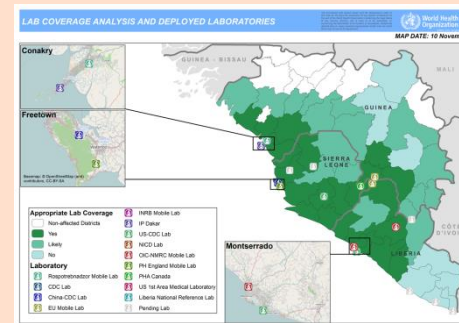
- Travel time >10H – Not well covered
- Travel time higher than 5H and lower than 10H – Likely covered
- Travel time <5H – Well covered

### Average speed within districts

- 40 Km/H

## Outputs

### Laboratory coverage maps – Laboratory coverage of districts (based travel time from sample pick-up location to laboratory)



### Sensitivity Analysis – Laboratory coverage of districts (depending on definition of coverage and average speed)

Average Speed within districts (in KM/H)	Covered within travel time (in H)							
	2:30	5:00	7:30	10:00	12:30	15:00	17:30	20:00
10	4%	9%	21%	53%	68%	81%	83%	94%
20	9%	28%	57%	79%	85%	96%	96%	98%
30	17%	45%	72%	83%	91%	96%	98%	100%
40	23%	51%	79%	85%	92%	96%	98%	100%
50	23%	53%	81%	85%	92%	96%	98%	100%
60	25%	60%	81%	87%	94%	96%	98%	100%

1 Calculated for each district using distance between: district center and furthest point away within district

# LAB COVERAGE ANALYSIS AND DEPLOYED LABORATORIES

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.



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MAP DATE: 10 November



Basemap: © OpenStreetMap (and) contributors, CC-BY-SA

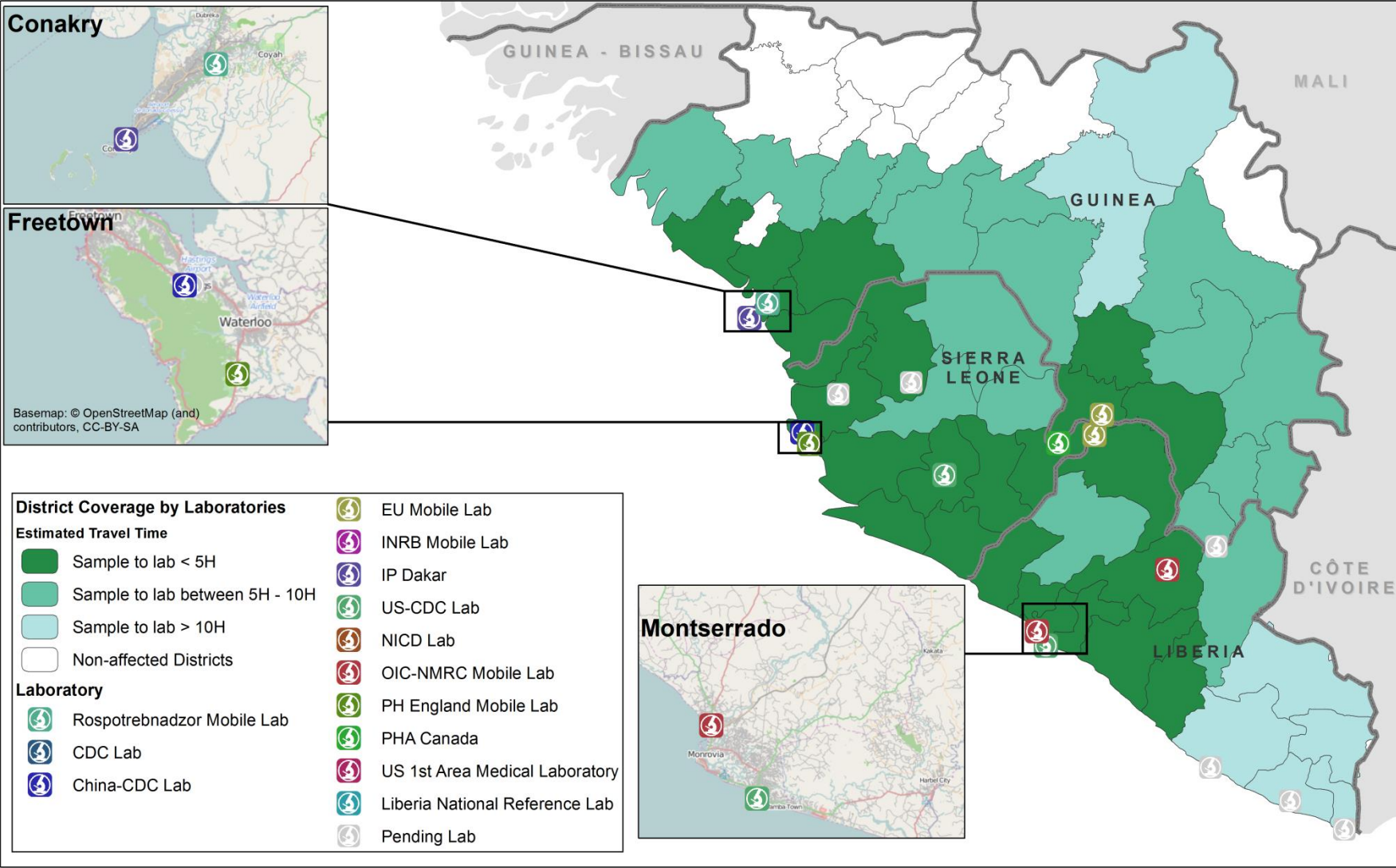
**District Coverage by Laboratories**

**Estimated Travel Time**

- Sample to lab < 5H
- Sample to lab between 5H - 10H
- Sample to lab > 10H
- Non-affected Districts

**Laboratory**

- Rospotrebnadzor Mobile Lab
- CDC Lab
- China-CDC Lab
- EU Mobile Lab
- INRB Mobile Lab
- IP Dakar
- US-CDC Lab
- NICD Lab
- OIC-NMRC Mobile Lab
- PH England Mobile Lab
- PHA Canada
- US 1st Area Medical Laboratory
- Liberia National Reference Lab
- Pending Lab



# LAB COVERAGE ANALYSIS AND NEW CASES PAST 21 DAYS



MAP DATE: 10 November

**Number of Cases, Past 21 Days**

- 1 - 5
- 6 - 20
- 21 - 50
- 51 - 100
- 101 - 215

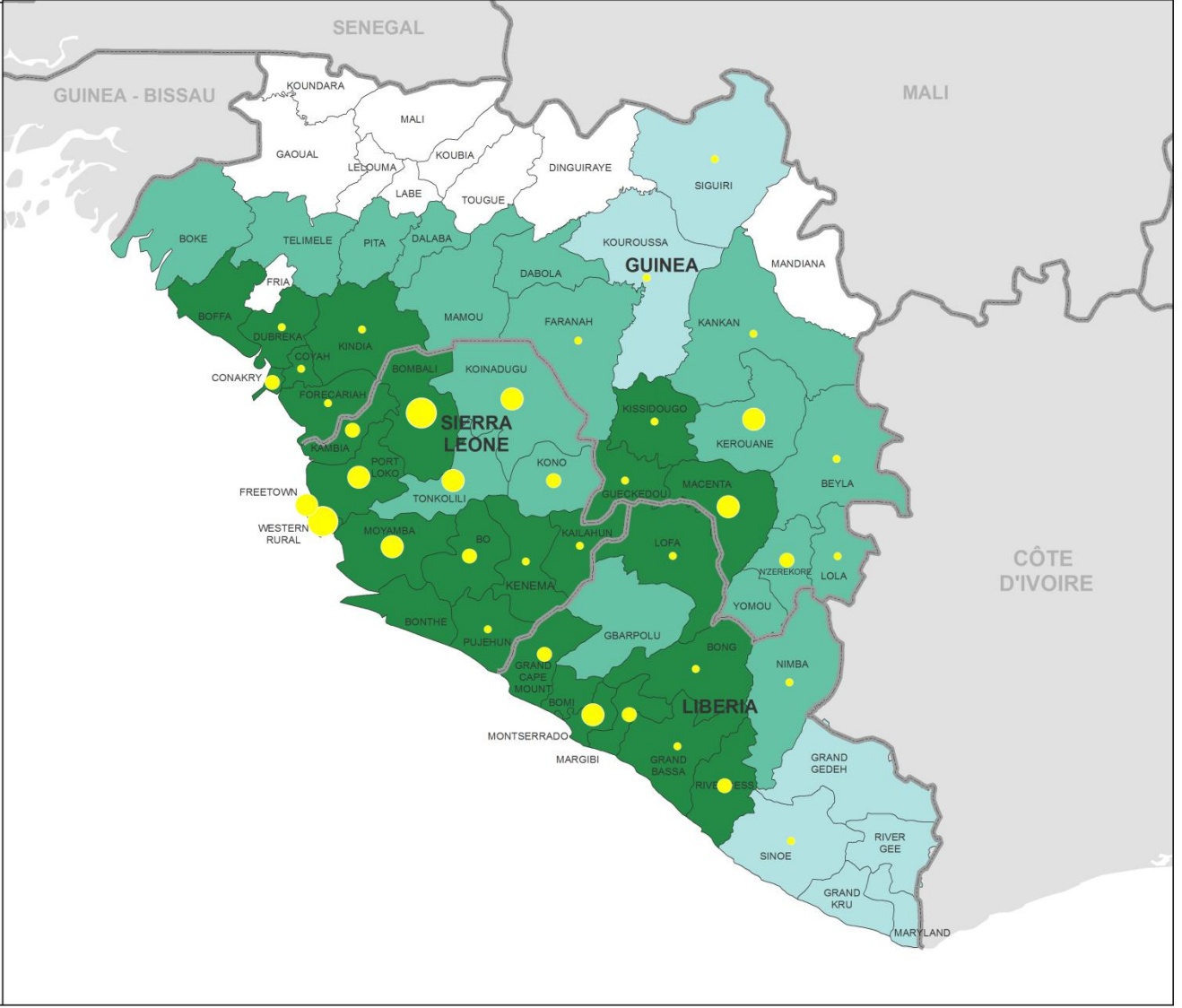
**District Coverage by Laboratories**

**Estimated Travel Time**

- Sample to lab < 5H
- Sample to lab between 5H - 10H
- Sample to lab > 10H
- Non-affected Districts

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

**Map Scale (A3): 1:4,000,000**  
1 cm = 40 km



# Lab coverage – Sensitivity Analysis

PRELIMINARY

% of districts covered by laboratories

## Covered within travel time (in H)

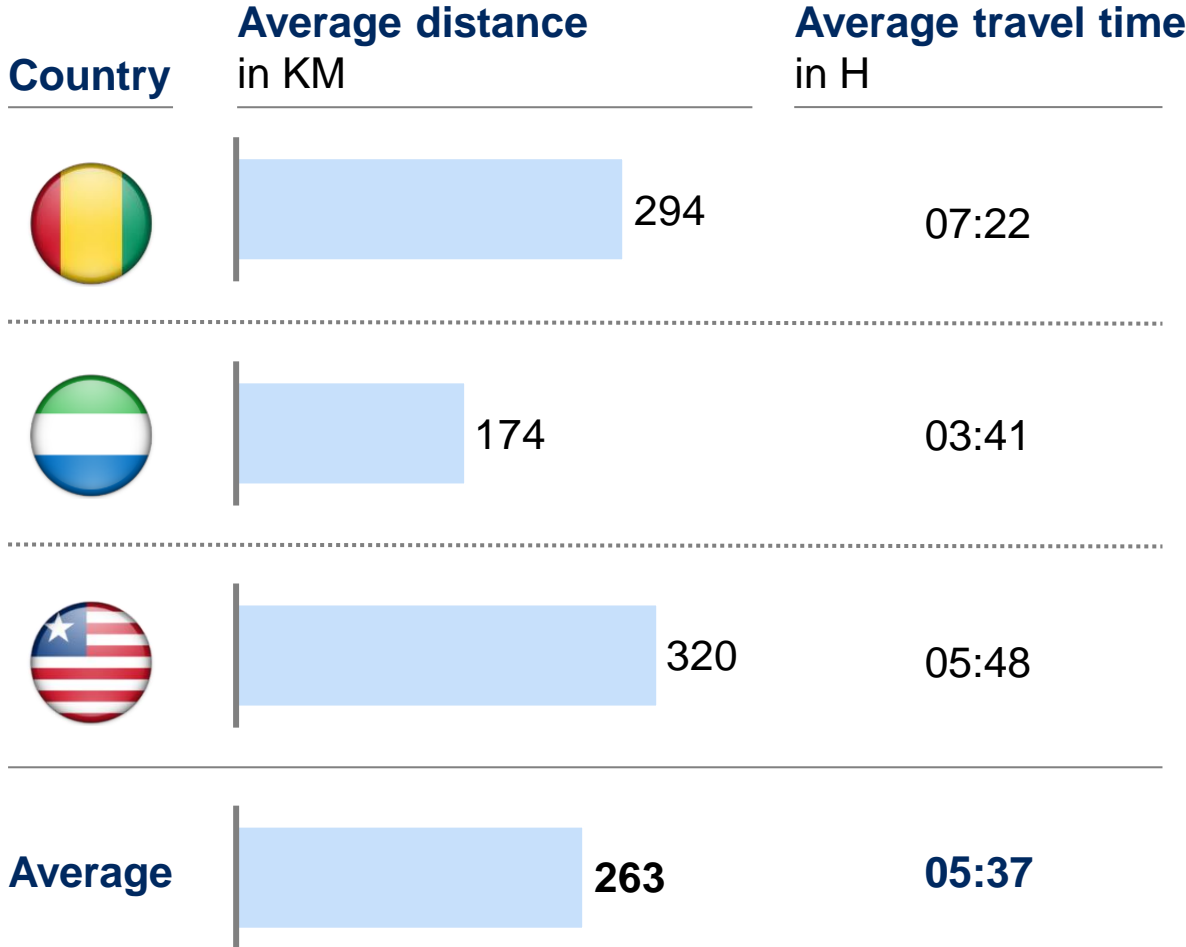
Average Speed within districts (in KM/H)

	2:30	5:00	7:30	10:00	12:30	15:00	17:30	20:00
10	4%	9%	21%	53%	68%	81%	83%	94%
20	9%	28%	57%	79%	85%	96%	96%	98%
30	17%	45%	72%	83%	91%	96%	98%	100%
40	23%	51%	79%	85%	92%	96%	98%	100%
50	23%	53%	81%	85%	92%	96%	98%	100%
60	25%	60%	81%	87%	94%	96%	98%	100%

# Average distance and travel time to a Laboratory

PRELIMINARY

Maximum distance/travel time from sample to laboratory



# Closest laboratory by district – Guinea

PRELIMINARY



Maximum distance/travel time from sample to laboratory

District	Closest Lab	Distance to closest lab (in KM)	Travel time <sup>1</sup> to closest lab (in H)
Siguiri	Conakry	828	11:25
Kankan	Conakry	782	9:29
Kouroussa	Conakry	695	11:00
Faranah	Gueckedou	328	7:41
Beyla	Gueckedou	323	7:26
Boke	Conakry	392	5:36
Mamou	Conakry	411	6:32
Kerouane	Gueckedou	289	10:21
Kindia	Conakry	210	3:49
Macenta	Gueckedou	180	3:44
Telimele	Conakry	335	5:48
Kissidougo	Gueckedou	145	3:32
Boffa	Conakry	220	3:40
Dabola	Conakry	486	8:46
Pita	Conakry	393	7:24
Lola	Gueckedou	319	5:25
Forecariah	Conakry	157	3:25
Gueckedou	Gueckedou	62	1:33
N'zerekore	Gueckedou	284	5:00
Dubreka	Conakry	98	2:14
Yomou	Gueckedou	306	6:33
Dalaba	Conakry	341	6:26
Coyah	Conakry	78	1:42
Conakry	Conakry	27	0:40

<sup>1</sup> Assuming 40KM/H average speed within district

# Closest laboratory by district – Sierra Leone

PRELIMINARY



Maximum distance/travel time from sample to laboratory

District	Closest Lab	Distance to closest lab (in KM)	Travel time <sup>1</sup> to closest lab (in H)
Koinadugu	Bo	345	07:28
Bombali	Bo	268	04:51
Moyamba	Bo	180	03:51
Tonkolili	Bo	200	05:48
Kenema	Bo	148	02:58
Port loko	Bo	279	04:13
Bo	Bo	60	01:30
Kono	Kailahun	221	05:20
Pujehun	Bo	128	04:18
Kailahun	Kailahun	67	01:41
Bonthe	Bo	187	03:51
Kambia	Bo	324	04:31
Western rural	Western Rural	24	00:36
Freetown	Western Rural	9	00:44

<sup>1</sup> Assuming 40KM/H average speed within district



# Closest laboratory by district – Liberia

PRELIMINARY



Maximum distance/travel time from sample to laboratory

District	Closest Lab	Distance to closest lab (in KM)	Travel time <sup>1</sup> to closest lab (in H)
Nimba	Bong	220	05:52
Grand Gedeh	Bong	384	10:35
Lofa	Lofa	92	02:17
Gbarpolu	Margibi	367	07:07
Sinoe	Margibi	405	12:54
Bong	Bong	97	02:25
Grand Bassa	Margibi	239	04:05
Rivercess	Margibi	304	06:24
River Gee	Margibi	612	13:24
Grand Cape Mount	Montserrado	214	04:39
Grand Kru	Bong	612	16:23
Margibi	Margibi	54	01:20
Maryland	Bong	619	19:12
Bomi	Montserrado	153	02:55
Montserrado	Montserrado	40	00:59

<sup>1</sup> Assuming 40KM/H average speed within district

# Back-up

# Estimated travel time between districts in Guinea

Travel time in Hours

- Assuming**
- November/December weather
  - Travel using a car suited for the roads used
  - Travel time includes the break for the drivers
  - If the distance exceeds 10 hours, a night should be accounted for



	From																									
Districts	Conakry	Gueckedou	Macenta	Beyla	Boffa	Boke	Coyah	Dabola	Dalaba	Dinguiraye	Dubreka	Faranah	Forecariah	Kankan	Kerouane	Kindia	Kissidougou	Kouroussa	Labe	Lola	Mamou	N'Zerekore	Pita	Siguiri	Telimele	Yomou
Conakry																										
Gueckedou	08:00																									
Macenta	10:00	01:30																								
Beyla	15:00	05:00	04:30																							
Boffa	02:00	09:30	14:30	18:30																						
Boke	03:30	11:30	16:30	20:30	02:00																					
Coyah	01:00	08:00	12:30	16:30	03:00	04:30																				
Dabola	07:00	09:00	08:30	12:30	05:00	10:00	05:30																			
Dalaba	05:00	08:00	09:30	16:30	05:00	09:00	04:30	03:00																		
Dinguiraye	08:00	11:00	11:30	10:30	07:00	12:00	07:30	02:00	05:00																	
Dubreka	01:00	09:00	13:30	17:30	01:30	03:00	01:30	06:30	05:30	08:30																
Faranah	08:00	05:00	06:30	10:30	07:00	11:00	06:30	03:00	04:00	04:00	08:00															
Forecariah	02:00	09:00	14:00	17:30	03:30	06:00	01:30	07:30	06:30	09:30	03:00	08:30														
Kankan	06:30	09:00	06:30	04:00	08:30	13:30	09:00	04:00	06:00	06:00	11:00	06:30	10:30													
Kerouane	10:30	08:30	07:00	02:00	12:30	17:30	12:00	08:00	10:00	09:00	14:00	09:30	14:30	04:00												
Kindia	02:00	09:00	11:30	15:30	03:00	06:00	01:30	04:00	03:00	06:00	03:00	05:00	03:00	07:30	11:30											
Kissidougou	08:00	02:00	03:30	07:30	09:30	11:00	08:30	05:00	06:00	06:00	10:00	02:00	10:00	04:00	08:00	07:00										
Kouroussa	08:00	11:00	08:30	14:30	07:00	12:00	07:30	02:00	05:00	04:00	08:30	05:00	09:00	01:30	05:30	06:00	10:00									
Labe	07:00	09:30	11:00	17:30	07:30	10:30	06:30	05:00	02:00	07:00	08:00	06:00	08:00	08:30	12:30	05:00	08:00	07:00								
Lola	14:00	04:00	02:40	02:40	16:00	16:30	13:00	11:30	10:30	14:30	16:30	08:30	14:30	10:00	06:00	13:30	06:30	11:00	11:30							
Mamou	04:00	07:00	08:30	12:30	04:30	08:00	03:30	02:00	01:00	04:00	05:00	03:00	05:00	05:30	09:30	02:00	05:00	04:00	03:00	12:30						
N'Zerekore	13:30	03:30	02:00	02:00	15:00	15:30	12:00	10:30	09:30	11:30	15:30	07:30	13:30	09:00	05:00	12:30	05:30	14:30	13:30	02:00	10:30					
Pita	06:00	09:00	10:30	14:30	06:30	06:00	05:30	04:00	01:00	06:00	07:00	05:00	07:00	07:30	11:30	04:00	07:00	06:00	00:40	14:30	02:00	12:30				
Siguiri	09:00	09:00	08:30	05:00	10:30	15:30	11:00	06:00	08:00	08:00	13:00	07:30	12:30	02:00	05:00	09:30	06:00	03:30	10:30	14:00	07:30	13:00	09:30			
Telimele	04:00	11:00	12:30	16:30	05:00	08:00	03:30	06:00	05:00	08:00	03:30	07:00	05:00	11:30	14:00	02:00	09:00	08:00	07:00	15:30	04:00	14:30	06:00	13:30		
Yomou	15:30	05:30	04:00	04:30	17:00	17:30	14:00	12:30	11:30	12:30	17:30	09:30	15:30	11:00	07:00	14:30	07:30	16:30	15:30	03:00	12:30	02:00	14:30	13:00	16:30	

SOURCE: Mr. Ibrahima Traore

# Distance between districts in Guinea

Distances in KM can be sensitively different from A to B than from B to A



## Distance in KM

Districts	From																									
	Conakry	Gueckedou	Macenta	Beyla	Boffa	Boke	Coyah	Dabola	Dalaba	Dinguiraye	Dubreka	Faranah	Forecariah	Kankan	Kerouane	Kindia	Kissidougou	Kouroussa	Labe	Lola	Mamou	N'Zerekore	Pita	Siguiri	Telimele	Yomou
Conakry																										
Gueckedou	672																									
Macenta	723	90																								
Beyla	856	225	136																							
Boffa	153	751	802	935																						
Boke	308	851	902	1035	157																					
Coyah	50	625	676	809	136	292																				
Dabola	415	385	435	502	501	497	368																			
Dalaba	284	461	512	645	370	341	237	190																		
Dinguiraye	487	489	495	478	572	569	440	99	262																	
Dubreka	48	647	697	830	111	266	24	389	258	461																
Faranah	454	220	270	403	539	633	407	166	242	258	435															
Forecariah	100	636	686	819	186	341	50	378	247	450	81	417														
Kankan	662	270	272	255	747	744	615	248	437	224	643	205	625													
Kerouane	747	215	126	109	833	926	700	394	536	370	728	294	710	149												
Kindia	137	543	594	727	222	309	90	286	155	358	118	325	139	533	618											
Kissidougou	591	83	133	266	677	770	544	303	380	408	572	138	554	189	157	462										
Kouroussa	575	353	359	342	661	657	528	161	351	137	556	153	538	88	235	446	272									
Labe	426	555	605	738	347	326	329	249	94	321	358	336	340	496	629	247	473	410								
Lola	896	262	173	133	981	1075	849	618	684	594	877	443	859	374	226	767	306	459	778							
Mamou	309	451	501	611	395	426	262	110	85	181	291	232	273	357	504	180	369	270	178	674						
N'Zerekore	857	224	135	137	943	1,037	811	633	647	609	839	405	821	388	241	729	268	473	740	39	636					
Pita	337	515	566	699	286	287	290	210	54	281	318	296	300	457	590	208	434	370	40	738	139	700				
Siguiri	731	400	402	385	817	814	684	317	507	251	713	311	695	131	278	602	320	286	566	503	293	517	526			
Telimele	262	663	714	847	183	188	210	314	158	386	220	445	259	561	738	121	582	474	164	887	300	849	104	630		
Yomou	898	264	176	204	984	1,077	851	673	687	649	879	445	861	428	281	769	308	513	780	137	676	100	741	559	889	

# Estimated travel time between districts in Sierra Leone

Travel time in Hours

- Assuming**
- November/December weather
  - Travel using a car suited for the roads used
  - Travel time includes the break for the drivers
  - If the distance exceeds 10 hours, a night should be accounted for



		From												
Districts		Bo	Kailahun	Freetown	Bombali	Port Loko	Bonthe	Kambia	Kenema	Koinadugu	Kono	Moyamba	Pujehun	Tonkolili
To	Bo													
	Kailahun	03:00												
	Freetown	03:30	07:00											
	Bombali	03:00	05:30	03:00										
	Port Loko	02:30	06:00	03:00	02:00									
	Bonthe	02:00	04:00	05:00	04:00	04:00								
	Kambia	03:00	06:30	04:00	03:00	00:45	04:00							
	Kenema	01:00	02:00	04:30	04:00	05:00	02:00	05:00						
	Koinadugu	05:00	07:00	05:00	02:00	04:00	06:00	05:00	07:00					
	Kono	06:00	04:00	06:00	04:00	05:00	07:00	04:00	04:00	05:00				
	Moyamba	02:00	05:00	04:00	04:00	03:00	03:00	04:00	03:00	06:00	07:00			
	Pujehun	03:00	05:30	05:00	05:00	05:00	03:00	05:00	02:30	06:00	08:00	03:30		
	Tonkolili	03:30	07:00	04:00	00:45	03:00	05:00	03:00	05:00	02:30	03:00	05:00	05:00	

SOURCE: Mr. Yarabah Conteh

# Distance between districts in Sierra Leone

Distances in KM can be sensitively different from A to B than from B to A



Distance in KM

		From																	
		Bo	Kailahun	Freetown	Bombali	Port Loko	Bonthe	Kambia	Kenema	Koinadugu	Kono	Moyamba	Pujehun	Tonkolili					
To	Districts	Bo																	
	Districts	Kailahun	185																
	Districts	Freetown	239	422															
	Districts	Bombali	194	367	185														
	Districts	Port Loko	210	401	119	110													
	Districts	Bonthe	113	296	246	269	250												
	Districts	Kambia	263	454	173	147	50	303											
	Districts	Kenema	69	117	305	253	276	180	330										
	Districts	Koinadugu	246	419	302	133	212	321	266	306									
	Districts	Kono	191	167	340	239	273	302	327	132	291								
	Districts	Moyamba	106	289	118	186	127	128	181	173	238	273							
	Districts	Pujehun	76	227	312	267	283	181	337	110	319	236	179						
	Districts	Tonkolili	107	279	208	110	144	221	198	166	162	152	143	179					

# Estimated travel time between districts in Liberia



- Assuming**
- November/December weather
  - Travel using a car suited for the roads used
  - Travel time includes the break for the drivers
  - If the distance exceeds 10 hours, a night should be accounted for

Travel time in Hours

		From														
		Bong	Lofa	Margibi	Montserrado	Bomi	Gbarpolu	Grand Bassa	Grand Cape Mount	Grand Gedeh	Grand Kru	Maryland	Nimba	River Gee	Rivercess	Sinoe
To	Districts															
		Bong														
	Lofa	04:30														
	Margibi	02:00	07:00													
	Montserrado	04:30	09:00	02:00												
	Bomi	06:00	11:00	04:00	02:00											
	Gbarpolu	07:30	13:00	05:00	05:00	03:00										
	Grand Bassa	04:00	08:00	02:00	02:00	04:00	07:00									
	Grand Cape Mount	07:00	12:00	05:00	03:00	02:00	05:00	06:00								
	Grand Gedeh	08:00	13:00	10:00	12:00	12:00	17:00	12:00	15:00							
	Grand Kru	15:00	20:00	17:00	19:00	19:00	23:30	19:00	22:00	07:00						
	Maryland	18:00	23:30	21:00	23:30	23:30	23:30	23:00	23:30	11:00	03:00					
	Nimba	03:00	08:00	04:00	07:00	09:00	12:00	07:00	10:00	06:00	13:00	13:00				
	River Gee	17:00	15:00	12:00	14:00	14:00	19:00	14:00	17:00	03:00	05:00	05:00	08:00			
	Rivercess	07:00	10:00	05:00	05:00	07:00	10:00	03:00	08:00	13:00	11:00	18:00	11:00	15:00		
	Sinoe	14:00	16:00	11:00	11:00	13:00	16:00	09:00	14:00	08:00	05:00	10:00	17:00	07:00	7:00	

SOURCE: Mr Raphael Davis

# Distance between districts in Liberia

Distance in KM

Distances in KM can be sensitively different from A to B than from B to A



		From														
Districts		Bong	Lofa	Margibi	Montserrado	Bomi	Gbarpolu	Grand Bassa	Grand Cape Mount	Grand Gedeh	Grand Kru	Maryland	Nimba	River Gee	Rivercess	Sinoe
To	Bong															
	Lofa	198														
	Margibi	126	300													
	Montserrado	168	326	40												
	Bomi	261	417	131	116											
	Gbarpolu	319	568	282	267	179										
	Grand Bassa	176	306	155	172	249	400									
	Grand Cape Mount	304	471	185	148	75	180	306								
	Grand Gedeh	281	458	423	448	539	690	296	596							
	Grand Kru	556	692	657	583	660	811	530	717	246						
	Maryland	571	683	647	574	650	801	521	707	237	103					
	Nimba	105	299	264	289	380	531	216	437	184	418	409				
	River Gee	442	592	556	581	672	823	429	729	145	101	92	318			
	Rivercess	179	348	248	265	342	493	133	399	260	494	485	180	393		
	Sinoe	342	536	328	345	422	573	266	479	78	238	229	262	155	210	