

Infections invasives à méningocoque et prévention vaccinale

Professeur Muhamed-Kheir Taha, MD, PhD, HDR

Unité des Infections Bactériennes Invasives

Centre National de Références des méningocoques et de *Haemophilus influenzae*

Centre collaborateur OMS des méningites

Paris 20 Mars 2025

Liens d'intérêt

- Travaux scientifiques à l'Institut Pasteur en collaboration et financement par GSK, Pfizer et Sanofi Pasteur.
- Conférences et Advisory Boards pour GSK, Pfizer et Sanofi Pasteur.
- Financement des travaux de recherche par la Fondation TOTAL
- Brevet Bexsero *Neisseria meningitidis* X (Novartis/GSK).
- Brevets des tests rapides de diagnostic de *Neisseria meningitidis*.
- Crédits institutionnels pour réaliser des formations internationales sur la méningite (Pfizer, CDC, Sanofi).
- Président de l'European Meningococcal and *Haemophilus* Disease Society (EMGM).
- Membre du Global Meningococcal Initiative (GMI)
- Membre du Task Force de l'OMS pour « Defeating meningitis by 2030 »

Facteurs de risque pour une hospitalisation pour une infection invasive à méningocoque

Raisons médicales :

- Contacts étroits avec des patients atteints de l'IIM ;
- Sujets présentant un déficit terminal en complément ou recevant un traitement anti-C5 ;
- Sujets présentant d'autres déficits en complément (properdine facteur D) ;
- Sujets présentant une asplénie anatomique ou fonctionnelle ;
- Sujets ayant reçu une greffe de cellules souches hématopoïétiques ;
- VIH

Raisons professionnelles/sociétales:

- Voyageurs
- Militaires,
- Pèlerins,
- Rassemblements de masse/mouvements de population
- Personnel de laboratoire travaillant sur les méningocoques,
- HSH,
- Etudiants dans les dortoirs.

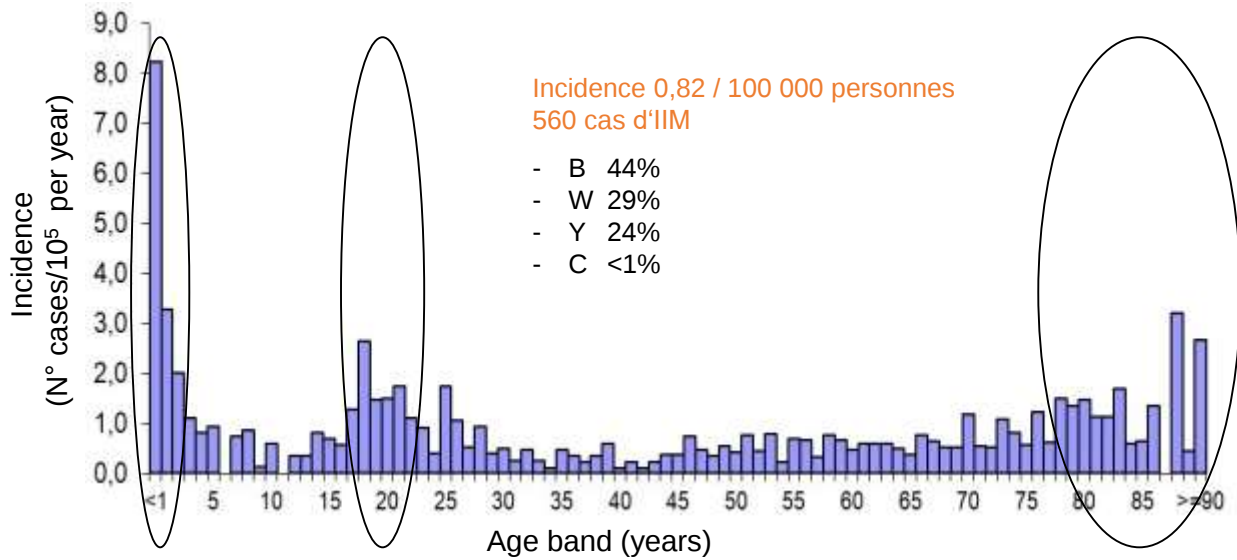
IIM : Infection Invasive à Méningocoque

Exemples choisis d'IIM en association avec un voyage, rassemblement de masse ou une surpopulation

Setting	Example	Countries	Serogroup	Year of outbreak
Religious pilgrimage	Hajj and Umrah	Saudi Arabia, World (including France)	A, W	1987, 1992, 1997, 2000, 2001
Ceremonial gathering	Funeral	Liberia	C	2017
Sporting event	International youth football tournament	Belgium The Netherlands Germany, Denmark	C	1997
Other gatherings of adolescents/young adults	World Scout Jamboree	Japan, Sweden, Scotland	W	2015
	School bus	Australia	B	2005
	University campus	USA	B	2013–2018 (10 outbreaks)
Refugee population	Refugee camp	Italy	X	2015/2016
Military personnel	Military camp	India	A	2006

[Dubey et al. Hum Vaccin Immunother. 2021; 17\(7\): 2216–2224.](#)

Incidence des IIM par âge en France, 2023

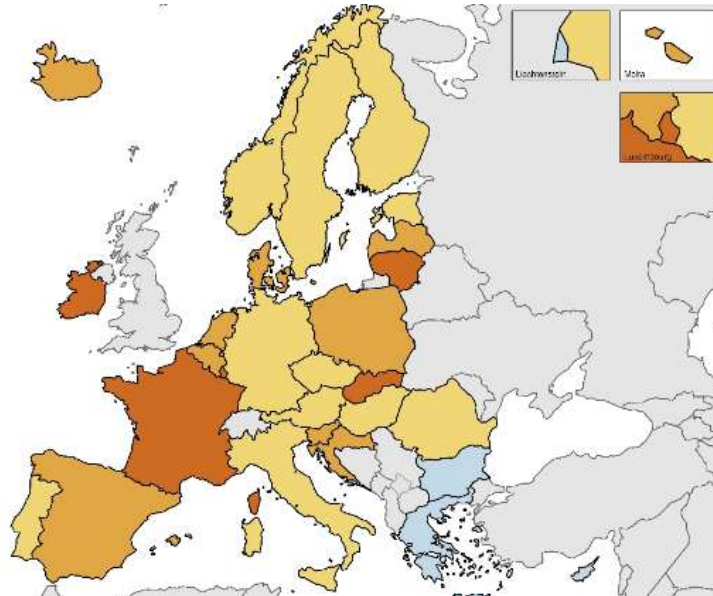
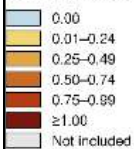


<https://www.santepubliquefrance.fr/maladies-et-traumatismes/maladies-a-prevention-vaccinale/infections-invasives-a-meningocoque/documents/bulletin-national2/infections-invasives-a-meningocoque-en-france-en-2023>

Infections invasives à méningocoque Europe 2022



Notification rate
(per 100 000 population)



2022 :

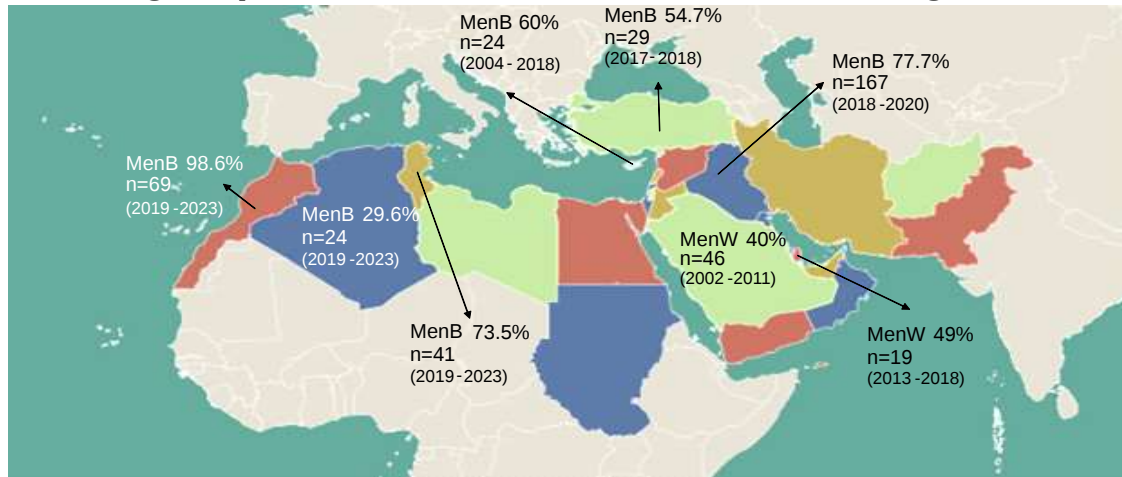
- incidence 0,3/100000
- 1149 cas d'IIM

Répartition :

- B 62%
- C 6%
- Y 16%
- W 10%
- Autres 6 %

European Centre for Disease Prevention and Control. Invasive meningococcal disease. In: ECDC. Annual epidemiological report for 2022. Stockholm: ECDC; 2024

Serogroup distribution across the MENA region



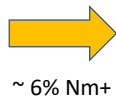
- Le fardeau réel des IIM reste mal compris au Moyen-Orient
- La définition et la confirmation des cas varient dans la région MENA
- L'incidence varie de <0,2 à 13 cas/100 000
- MenB et MenW sont répandus dans différents pays

Al-Abri et al., J Infect. 2023. Epub 20231020. doi: 10.1016/j.jinf.2023.10.011.
Smaoui et al. Int J Infect Dis. 2022;115:101-5. doi: 10.1016/j.ijid.2021.11.036.

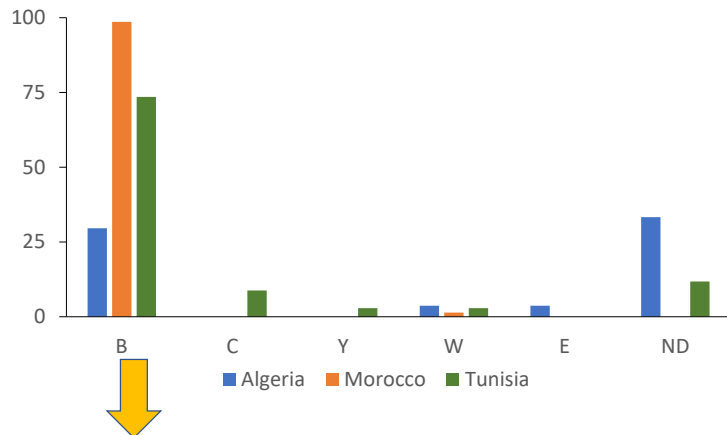
MENINGSTOP : Une surveillance prospective des maladies invasives à méningocoque dans en Afrique du Nord

2019-2023

N° d'échantillons	Total
Algérie	452
Maroc	1301
Tunisie	614



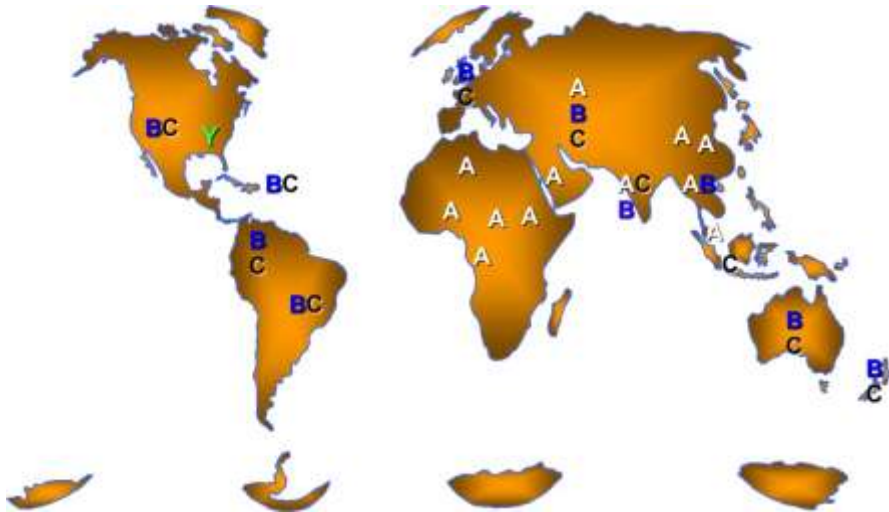
~ 6% Nm+



Pays	Total	<1y	1-4y	5-15y	
Algérie	30	13 (42%)	8 (27%)	9 (31%)	
Tunisie	41	13 (32%)	19 (46%)	9 (22%)	

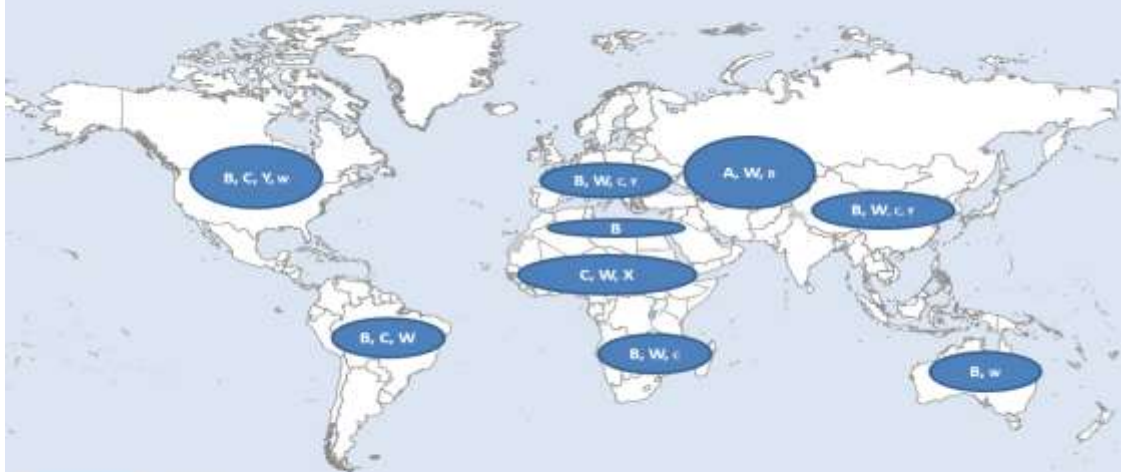
Smaoui et al. Int J Infect Dis. 2022;115:101-5. doi: 10.1016/j.ijid.2021.11.036.

Distribution mondiale des sérogroupes de méningocoques (fin 20^{ème} siècle)



Invasive Meningococcal Disease – Serogroup distribution, 2019

World Health Organization
Map date: January 2020

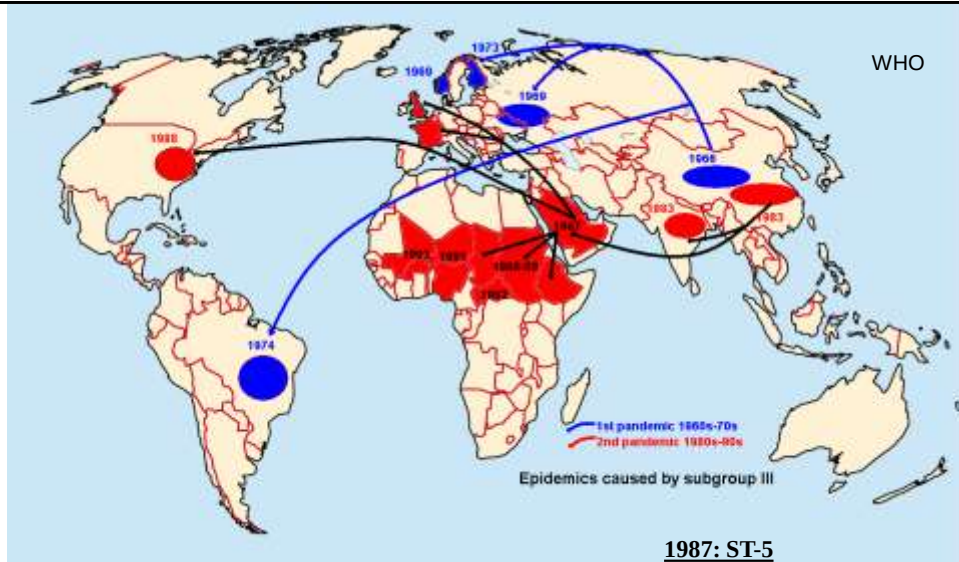


SEROGROUP Most frequent
SEROGROUP Less frequent

Data Source: World Health Organization
Map Production: WHO Health Emergencies Programme

The distribution and serogroup names and the designations used on this map do not imply the acceptance of any scientific position or the part of the World Health Organization concerning the legal status of the countries, territories, cities or areas or of its authorities, or concerning the boundaries or the limits of its competence. In order to avoid any confusion, the names of the countries, territories, cities or areas and the designations used on this map do not imply the acceptance of any scientific position or the part of the World Health Organization concerning the legal status of the countries, territories, cities or areas or of its authorities, or concerning the boundaries or the limits of its competence.

© WHO 2020. All rights reserved.



1987: ST-5

1996: ST-7

Since 2003: ST-2859

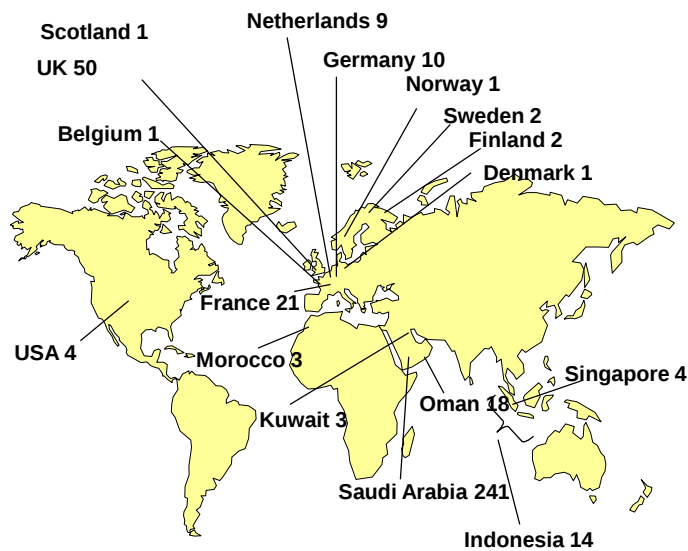
ST-2859 (1, 3, 2, 1, 3, 2, 19)

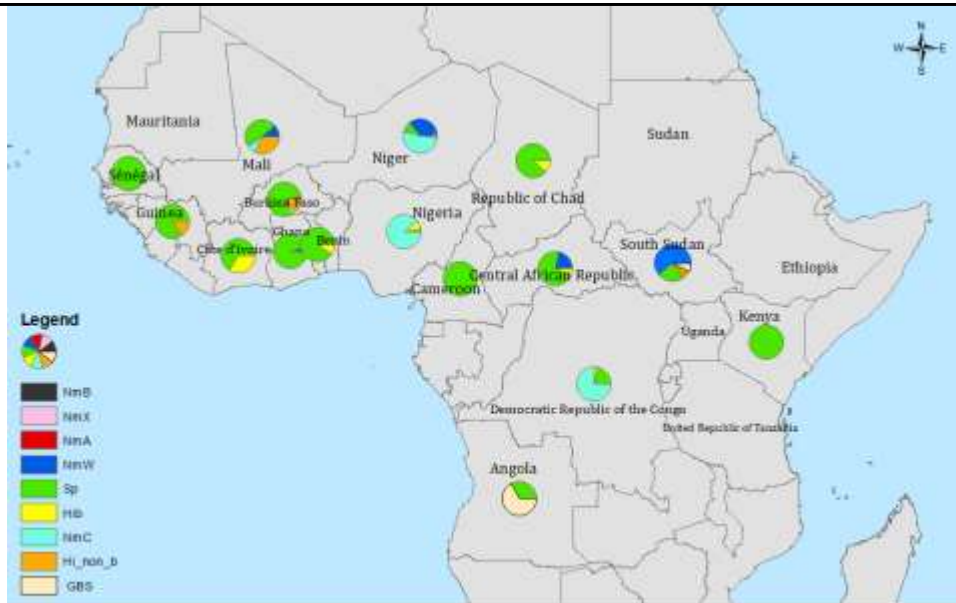
ST-5 (1, 1, 2, 1, 3, 2, 3)

ST-7 (1, 1, 2, 1, 3, 2, 19)

successive clonal
replacements

Global emergence of serogroup W of the clonal complex ET-37/ST-11 in 2000





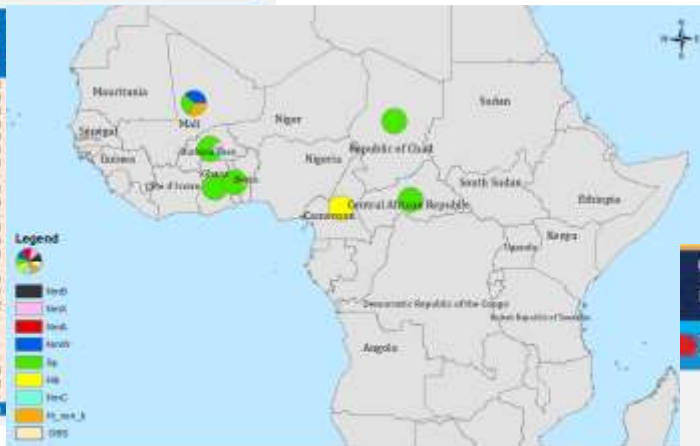
Mapping of main Meningitis pathogens identified, week 01 – 52, 2024

<http://www.who.int/wer>

Mapping of main Meningitis pathogens identified, week 01 – 06, 2025

Table 2: Synthèse de la situation épidémiologique par pays, semaine 01-06, 2025 /
Summary of the Epidemiological situation per country, week 01-06, 2025

Pays	Cas	Morts	Letalité (%)
Country	Cases	Deaths	CFR (%)
Angola	26	3	11.5
Burkina Faso	236	2	0.8
Burundi	221	4	1.8
Cameroun	24	0	0.0
Cote d'Ivoire	70	0	0.0
Rep. Centrafricaine	49	0	0.0
Cote d'Ivoire	6	0	0.0
Ethiopie	-	-	-
Ghana	121	15	12.4
Gambie	61	1	1.6
Gambie-Bissau	-	-	-
Gambie	3	0	0.0
Kenya	0	0	0.0
Mali	62	0	0.0
Mali	0	0	0.0
Niger	141	14	9.9
Nigeria	91	3	3.3
RD Congo	746	54	7.2
Senegal	-	-	-
South Sudan	9	8	-
Soudan	-	-	-
Tanzanie	-	-	-
Tchad	20	7	35.0
Togo	131	7	5.3
Togo	-	-	-
Total	2910	114	3.9



The boundaries and country names and the designations used on this map do not imply the expression of any opinion whatsoever on the part of 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. Conflict lines on maps represent approximate borders lines for which there may not yet be full agreement.



Table 3: Pathogènes identifiés par pays, semaine 01 – 06, 2025 /
Pathogens identified per country, week 01 – 06, 2025

Pays	NmB	NmX	NmA	NmW	Sp	Hib	NmC	Hi_nab_b	GBS
Country	NmB	NmX	NmA	NmW	Sp	Hib	NmC	Hi_nab_b	GBS
Total	740	727	2	229	39	0	0	0	0

NmC Nigeria 2013-2014

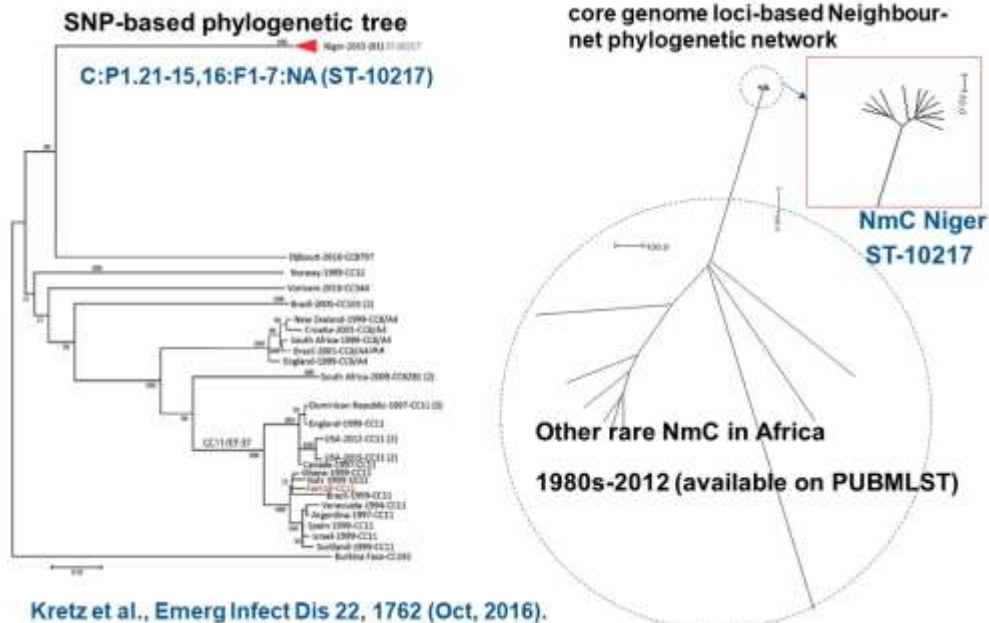
Year	States	total Population	Total N° of cases	Attack rate Per 100 000	Total N° of fatal cases	Mortality rate
2013	Sokoto	127097	856	673	58	6.8
2014	Kebbi	201457	333	165	35	10.5

C:P1.21-15,16 F1-7: cc NA (ST-10217)



Funk et al. *PLoS Curr* 2014;6.

Genomic analysis of MenC



Undiagnosed illness - Liberia

- A cluster of sudden deaths of unknown aetiology in Sinoe County Liberia between 23 April and 7 May 2017, a total of 31 cases including 13 deaths.
- Fever, abdominal pain, diarrhea, vomiting, and mental confusion. Some patients presented with purpura and/ or petechiae.
- *Neisseria meningitidis* group C by PCR in clinical specimens (31 cases) and serological results of 3 cases
- Toxicological investigations were not suggestive of intoxication

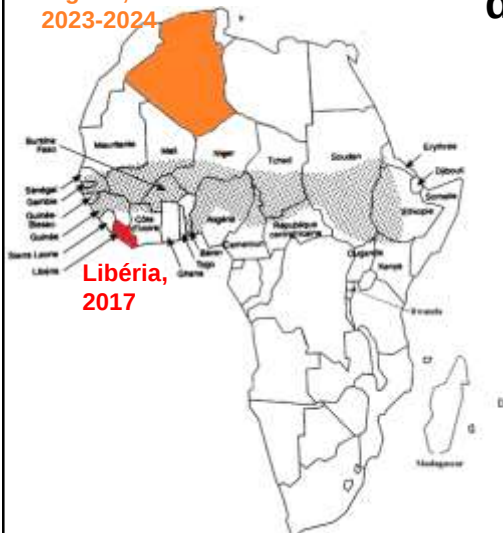
Bozio et al., Lancet Infect Dis. 2018;18(12):1360-7. doi: 10.1016/S1473-3099(18)30476-6.

The Liberian national reference laboratory in Margibi County

CDC Atlanta, USA, The National Institute for Communicable Diseases (NICD) and the National Institute of Occupational Health (NIOH) in Johannesburg, South Africa, The Institut Pasteur in Paris, France. Center for Analytical Chemistry in Vienna, Austria.

La propagation de NmC/CC10217 en dehors de la ceinture de la méningite

Algérie,
2023-2024



Libéria,
2017



France,
2018

Bozio et al., Lancet Infect Dis 2018 ,18(12):1360-1367; Bouheraoua et al. IJID Regions 13 (2024) 100458

Vaccines anti-méningocoque actuellement disponibles

Serogroup	Type	Brand	PS (µg)	Carrier	Use
A	Conjugate monovalent	MenAfriVac® Serum Institute of India	10	TT	• 1-29 y (catch-up ≥ 9 months)
C	Conjugate monovalent	Neisvac® (PFIZER)	10	TT	• ≥ 2 months
		Menjugate® (GSK)		CRM-197	
ACWY	Conjugate tetravalent	Menveo® (GSK)	10, 5, 5, 5	CRM-197	• ≥ 2 y
		Nimenrix® (PFIZER)	5, 5, 5, 5	TT	• ≥ 6 weeks
		Mencatrac® SANOFI PASTEUR	4, 4, 4, 4	Diphtheria toxoid	US 9 months- 55 y
		MenQuadfi® SANOFI PASTEUR	10, 10, 10, 10	TT	≥ 1 y
ACWYX	Conjugate pentavalent	NmCV-5 Serum Institute of India	5, 5, 5, 5, 5	TT (A, X) CRM-197 (CWY)	1-29 y

Recommandations de l'OMS pour Men5CV Pour introduire le NmCV-5

Type de pays	Caractéristiques	recommandations
La ceinture africaine de méningite	Tous les pays	Une seule dose chez les nourrissons et les jeunes enfants âgés de 9-18 mois.
Pays à haut risque	>10 ans depuis la campagne préventive de masse initiale MenAfriVac >10 districts ont franchi le seuil épidémique ou qui ont enregistré >300 cas liés à des flambées épidémiques depuis 2011. - peut être élargie pour inclure les personnes jusqu'à l'âge de 29 an.	+Rattrapage : 1-19 ans ou 2-19 ans, selon la tranche d'âge couverte par le programme de vaccination

No travel history

- April 2024 IMDW in several countries worldwide.
- But the rebound of IMD including IMDW in several countries
- Using only genomic-based EU/EEA surveillance of invasive meningococcal disease (IMD)
 - Do these patients have been investigated if they have any epidemiological link between them?
 - Festivities cross the FR-BE frontiers?



November 2024

2024-VPD-00002 - Genomic-based EU/EEA surveillance of invasive meningococcal disease (IMD) (Long-Term Monitoring).
<https://epipulse.ecdc.europa.eu/typing/explore/Home/Index?data=NMENI.101.ST11>

With travel history

Since April 2024 and as 16 Aug 2024, 14 cases of recent travel to KSA for Umrah

- United States (6 cases),
- France (4 cases) including that mentioned in the previous slide
- United Kingdom (3 cases)

An international alert urged meningococcal disease vaccination ahead of Hajj travel

Whole Genome Sequencing (WGS) detected reemergence of Anglo-French Hajj strain derivatives



Meningococcal Disease Cases Linked to Travel to the Kingdom of Saudi Arabia (KSA): Ensure Pilgrims are Current on Meningococcal Vaccination

HAN HEALTH ALERT NETWORK

This is an official **CDC** HEALTH ADVISORY

Distributed via the CDC Health Alert Network
 May 20 2024, 10:30 AM ET
 CDC-HAN-00508

Recommended preferential use of alternative prophylaxis agents for cases associated with KSA travel

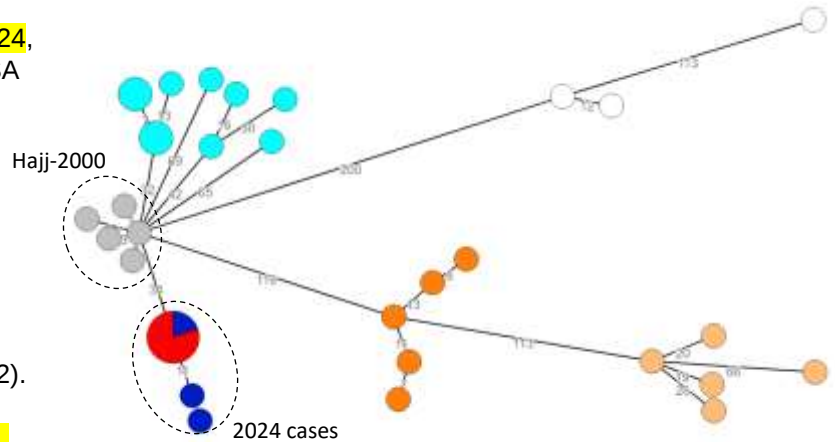
An international alert urges meningococcal disease vaccination ahead of Hajj travel

WGS detected reemergence of Anglo-French Hajj strain derivatives

Since April 2024 and as 29 May 2024, 12 cases of with recent travel to KSA for Umrah

- **United States** (5 cases),
 - **France** (4 cases),
 - **United Kingdom** (3 cases)
- children aged ≤ 18 years (n=2),
 - **adults** aged 18–44 years (n=4),
 - **adults** aged 45–64 years (n=4),
 - **adults** aged 65 years or older (n=2).

The identification of the cluster was based on WGS



Core-genome –based A grape Tree of representative W/cc11 isolates

Vachon et al.. MMWR Morb Mortal Wkly Rep. 2024;73(22):514-6. doi: 10.15585/mmwr.mm7322e1; Lucidarme et al. In preparation

Conclusions

- Meningococcal epidemiology remains unpredictable epidemiology.
- The importance of the inclusion of meningococcal septicemia in routine surveillance.
- Needs for real-time epidemiology to inform an optimal vaccination for travelers.
- Penta valent vaccine ACWXY can be optional for travelers to high-risk regions.