



Molecular Epidemiology and Global Transmission of Cholera

Critical reflection on alt. outbreak response strategies: What could have been done differently during and after the outbreak response?

3.9.2025

Intended Learning Objectives

Specific objectives of this session:

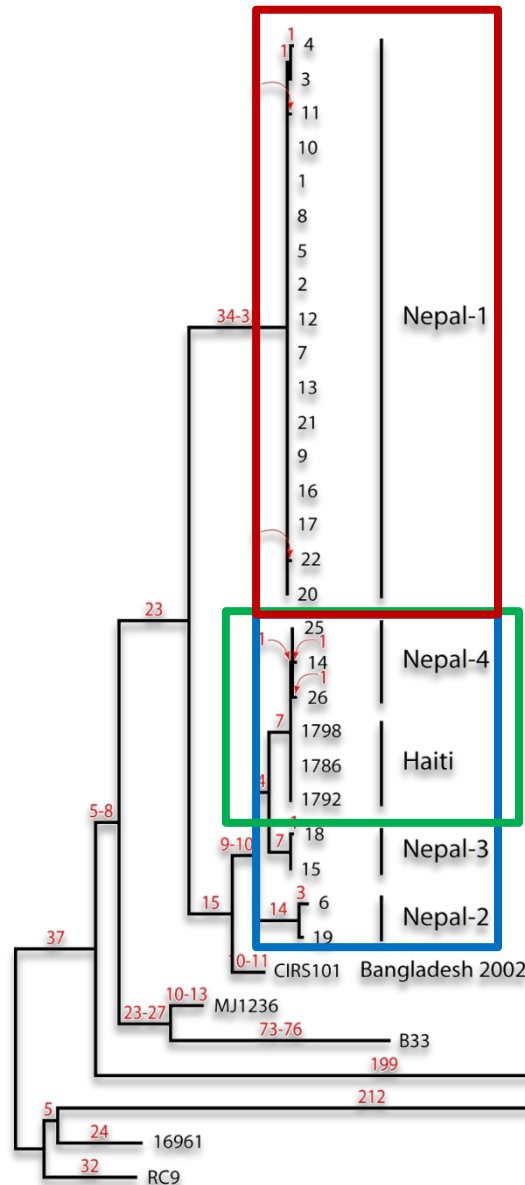
- Analyze the legal and political consequences of the 2010 Haiti cholera outbreak
- Evaluate the role of international peacekeeping operations in disease transmission
- Discuss lessons learned and future recommendations for outbreak prevention and response
- Critically reflect on alternative outbreak response strategies

Outline

This session consists of the following elements:

- Current legal consequences
- United Nations Peacekeeping operations
- Lessons learned by the UN
- Alternative outbreak response strategies

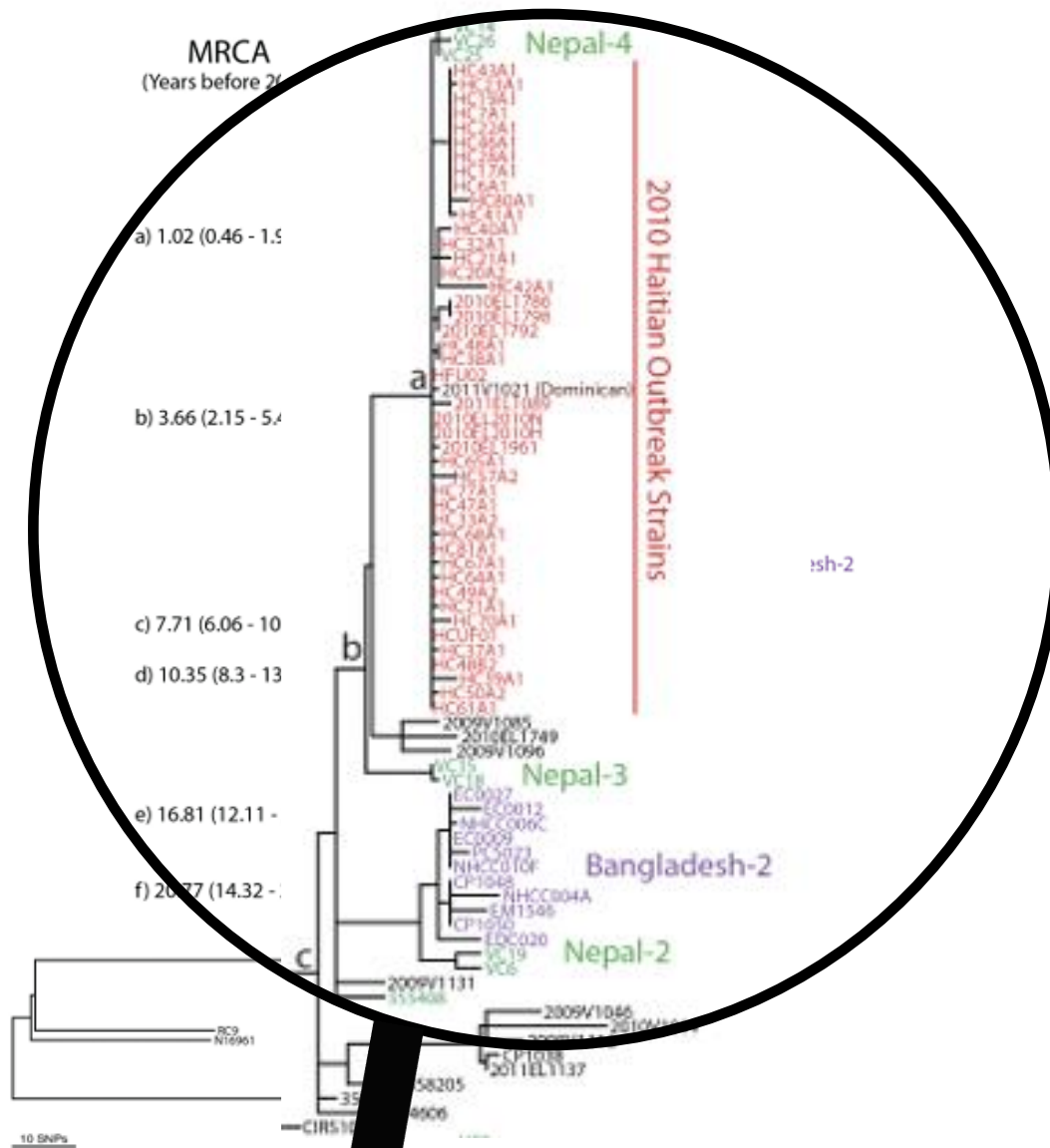
The search for “the smoking gun”!



- 2 major Nepalese clades (red and blue)
- Haiti nested within Nepal (blue)
- Near Match: Haiti – Nepal-4 (green)
- 1 to 2 SNPs difference between Nepal-4 and Haitian genomes)

		Nucleotide or amino acid in:						
Chromosome	Position	Reference strain	Haitian isolate			Nepalese isolate		
			1786	1792	1798	14	25	26
I	2787016	C Gly	C Gly	C Gly	C Gly	T Arg	T Arg	T Arg
I	1090536	T Ile	T Ile	T Ile	T Ile	T Ile	T Ile	G Ser
II	962762	C Ala	C Ala	C Ala	C Ala	T Ala	C Ala	C Ala

Introduction of cholera



- Still confirms a single introduction of Vc to Haiti
- Underline the need to use recent contemporary reference isolates from putative origins as the strains evolve and they are moving around the country

Current legal consequences



- UN spokesperson pointed out that UN did not accept or deny liability for the epidemic
- UN secretary general; Ban Ki-moon announced that UN was not willing to compensate any of the claimants
- Citing section 29 of the Convention on the Privileges and Immunities of the UN from 1946,
 - The UN invoking its immunity
- Haitian government sued the UN to eradicate cholera along with unspecified damages; personal injury, wrongful death, emotional distress, and loss of use of property and natural resources
- The epidemic has killed almost 11,000 people (2010 – 2024) and infected hundreds of thousands more

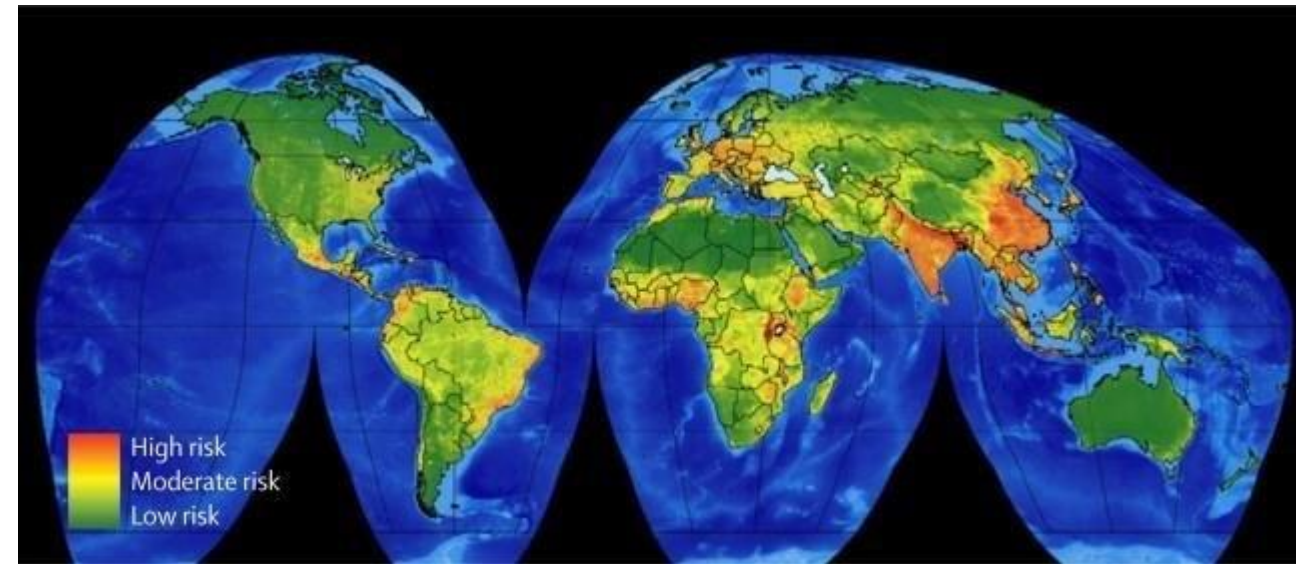
Current legal consequences, cont.



- It took six years of advocacy before the UN formally acknowledged its role in the outbreak
 - In 2016, Secretary-General Ban Ki-moon issued a public apology and launched a new approach to cholera in Haiti, including a \$400 million fund for victims and prevention efforts
 - However, only a small fraction of that amount has been raised

United Nations Peacekeeping operations – Was this the first time?

- Rumors claim that it's not the first-time deployment of peacekeepers have been responsible for introducing infectious diseases or changed pathogen clonality – no evidence!
- Striking similarity in clonality between various pathogens from sub-Saharan Africa and Southeast Asia



Global hotspots for emerging infectious diseases that originate in wildlife

United Nations Peacekeeping operations – Was this the first time?

Africa Current deployment (16)

Start of operation	Name of Operation		Location	Conflict
1991	United Nations Mission for the Referendum in Western Sahara (MINURSO)		Western Sahara	Moroccan occupation of Western Sahara
2003	United Nations Mission in Liberia (UNMIL)		Liberia	Second Liberian Civil War
2004	United Nations Operation in Côte d'Ivoire (UNOCI)		Côte d'Ivoire	Civil war in Côte d'Ivoire
2007	United Nations/African Union Mission in Darfur (UNAMID)		Sudan	Darfur Conflict
2010	United Nations Organization Stabilization Mission in the Democratic Republic of the Congo (MONUSCO)		Congo	Second Congo War
2011	United Nations Interim Security Force for Abyei (UNISFA)		Sudan	South Kordofan conflict
2011	United Nations Mission in the Republic of South Sudan (UNMISS)		South Sudan	Second Sudanese Civil War
2011	United Nations Support Mission in Libya (UNSMIL)		Libya	2011 Libyan civil war
1 July 2013	Multidimensional Integrated Stabilization Mission in Mali (MINUSMA)		Mali Azawad	Tuareg rebellion (2012)
1993–1995	United Nations Operation in Somalia II (UNOSOM II)		Somalia	Somali Civil War
1994	United Nations Aouzou Strip Observer Group (UNASOG)		Chad	Aouzou Strip dispute
			Libya	
1995–1997	United Nations Angola Verification Mission III (UNAVEM III)		Angola	Angolan Civil War
1997–1999	United Nations Observer Mission in Angola (MONUA)		Angola	Angolan Civil War
1998–1999	United Nations Observer Mission in Sierra Leone (UNOMSIL)		Sierra Leone	Sierra Leone civil war
1998–2000	United Nations Mission in the Central African Republic (MINURCA)		Central African Republic	Central African Republic mutinies
1999–2005	United Nations Mission in Sierra Leone (UNAMSIL)		Sierra Leone	Sierra Leone civil war
2000–2008	United Nations Mission in Ethiopia and Eritrea (UNMEE)		Eritrea	Eritrean-Ethiopian War
			Ethiopia	
2004–2007	United Nations Operation in Burundi (ONUB)		Burundi	Burundi Civil War
1999–2010	United Nations Organization Mission in the Democratic Republic of the Congo (MONUC)		Congo	Second Congo War
2007–2010	United Nations Mission in the Central African Republic and Chad (MINURCAT)		Chad, Central African Republic	Darfur Conflict, Civil war in Chad (2005–2010)
2005–2011	United Nations Mission in the Sudan (UNMIS)		Sudan	Second Sudanese Civil War

List of past peacekeeping operations | United Nations Peacekeeping

United Nations Peacekeeping operations – Was this the first time?



Government of Nepal
Ministry of Foreign Affairs

Home



- (1) United Nations Interim Force in Lebanon (UNIFIL)
- (2) United Nations Mission for the Referendum in Western Sahara (MINURSO)
- (3) United Nations Organization Stabilization Mission in the Democratic Republic of the Congo (MONUSCO)
- (4) United Nations Mission in Liberia (UNMIL)
- (5) United Nations Operation in Cote d'Ivoire (UNOCI)
- (6) United Nations Stabilization Mission in Haiti (MINUSTAH)
- (7) United Nations Mission in the Republic of South Sudan (UNMISS)
- (8) African Union-United Nations Hybrid Operation in Darfur (UNAMID)
- (9) United Nations Truce Supervision Organization (UNTSO)
- (10) United Nations Assistance Mission for Iraq (UNAMI)
- (11) United Nations Interim Security Force for Abyei (UNISFA)

Nepal is currently 7th largest troop and police contributor to the United Nations peacekeeping operations (as of November 2012). Nepal has conveyed its willingness to provide up to 5000 military peacekeepers at the request of the United Nations. Nepal has a stand-by arrangement with the United Nations for 2000 troops for peacekeeping purposes. So far, 68 Nepalese peacekeepers have sacrificed their valuable lives for the cause of world peace and security while serving in the peace missions under the UN umbrella.

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Nepalese peacekeepers have a very good reputation. In 1988 when the United Nations was awarded the Nobel Peace Prize, Mr. Ratna Gurung was also included in the Secretary General's official entourage that visited Oslo to receive the Prize. This was a recognition of Nepal's contribution to the maintenance of international peace and

United Nations Peacekeeping operations – Was this the first time?

INDIA'S CONTRIBUTION TO UN PEACEKEEPING MISSIONS



Indian Contribution

2. India has been the largest troop contributor to UN missions since inception. So far India has taken part in 43 Peacekeeping missions with a total contribution exceeding 1,60,000 troops and a significant number of police personnel having been deployed.

General Information

1. Since 1948, UN Peacekeepers have undertaken 67 Field missions. As on today there are approximately 93,368 personnel serving on 14 peace operations led by UNDPKO, in four continents. This represents a nine fold increase since 1999. A total of 114 countries have contributed military and police personnel to UN peacekeeping. Currently more than 80,879 of those serving are troops and military observers and about 12,489 are police personnel.

India

2. India has been the largest troop contributor to UN missions since inception.

United Nations Peacekeeping operations – Was this the first time?

"Water, sanitation and hygiene facilities on the site are far from adequate, increasing the risk the camp could become fertile ground for the spread of disease," Mahendra Sheth, regional health adviser for the UN Children's Fund (UNICEF), which is responsible for water and sanitation activities, said at the start of summer.

In April, a number of measles cases were reported in the camp, and between mid-March and mid-May, the number of diarrhoea cases tripled, the medical charity Médecins Sans Frontières (MSF) said.

An assessment conducted by MSF in April showed "clear inequalities" in water distributions, it said in a 15 May [press release](#). Some areas of the camp receive only four litres per person per day, MSF said, far less than the minimum 15-20 litres per person recommended in humanitarian emergencies.

"In some instances, people simply do not have access to water or sanitation," MSF emergency coordinator Stéphane Reynier wrote. "This is simply not acceptable."

Massoud Barzani, president of the Kurdistan Regional Government (KRG), recently accused the international community of "abandoning" the Syrian refugees in Kurdistan and asked foreign officials to bring the situation to the attention of their governments.

50 MILES JORDAN

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Containing disease in a Syrian refugee camp in Iraq



Drinking safe, walking tall

Photo: Wendy Bruene/UNICEF

United Nations Peacekeeping operations – Was this the first time?

- Request for support from WHO MoH
Gaza - Food and water testing
supplies
- Circulating Campy and Shigella
 - E. coli, Clostridium, Giardia,
Cryptosporidium, Listeria,
Campylobacter, Shigella, Salmonella,
entamoeba, norovirus, etc
- Strong suspicion for botulism being
present in selected food sources



<https://www.aljazeera.com/>



Khames Alrefi/Anadolu/via Getty Images

Lesson learned by the UN

- One of the most critical lessons was the need for strict sanitation protocols at peacekeeping bases
- Emphasize the importance of proper waste disposal systems, including independent oversight of sanitation infrastructure in mission areas
- Recognition of the need for pre-deployment health screenings and vaccinations for peacekeepers, especially when deploying to vulnerable regions with limited public health infrastructure
- The crisis highlighted the importance of transparent communication with host communities and engagement with local health systems to build trust and ensure rapid response to outbreaks

Lesson learned by the UN, cont.

- The outbreak raised legal and human rights debates about the UN's immunity and accountability
- Advocated for long-term investments in water, sanitation, and health infrastructure in countries where peacekeeping missions are deployed, recognizing that prevention is not just about internal protocols but also about supporting host nations' resilience

What could have been done differently

Alternative strategy

- Rapid deployment of Community Outbreak Response Teams
- Establishing decentralized, real-time data systems and empowering local health workers to report cases
- Proactive community education campaigns
- A more integrated approach combining water, sanitation, and hygiene infrastructure interventions with health services

Missed opportunity

- Delays in mobilizing trained teams and resources
- Fragmented data systems and slow reporting hindered early detection and targeted interventions
- Limited outreach in remote areas delayed behavioral change and adoption of preventive measures
- Lack of coordination between WASH and health actors

In summary

- The 2010 Haiti cholera outbreak serves as a critical case study in global health, molecular epidemiology, and international accountability.
- Genomic evidence strongly supports a single-source introduction of *Vibrio cholerae* from Nepal via UN peacekeepers.
- The outbreak exposed gaps in international protocols, particularly around sanitation, health screening, and crisis communication.
- Legal and ethical debates surrounding UN immunity highlight the need for reform in global governance structures.
- Moving forward, preventive strategies must include:
 - Strengthening local health systems
 - Transparent engagement with host communities
 - Rigorous health and sanitation standards for peacekeeping missions

References

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- Khames Alrefi/Anadolu website
- Al Jazeera website

Acknowledgements

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