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Monitoring and Mitigating Vector-Borne Diseases in Jordan: A Risk-Based Approach

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Jordan Center For Diseases Control – Regional Seminar on
Vector-Borne Diseases for Europe, 2025

Teramo, Italy / June 25–27, 2025

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Jordan Overview

- **location**: in the Middle East and the Arab world.
- **Strategic location:** crossroads between Asia, Africa, and Europe.
- About 100 km from the south-eastern coast of the Mediterranean Sea

- **Area:** 89,342 square kilometers.

- **Population:** approximately 11.5 million

- **Geographic Nature:** More than ¾ of the country is desert,

Jordan." Wikipedia, Wikimedia Foundation, 18 June 2025, https://en.wikipedia.org/wiki/Jordan. Accessed 18 June 2025.

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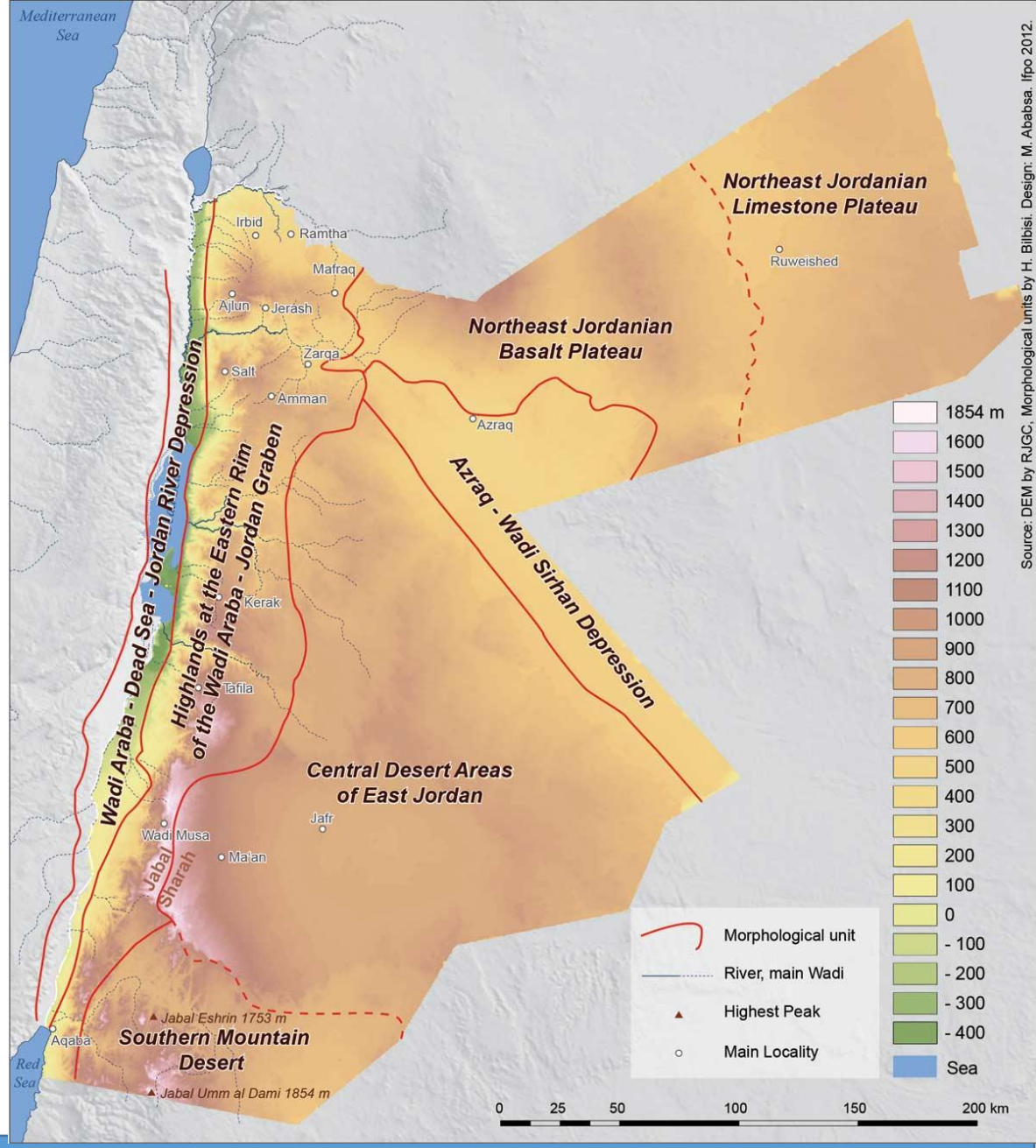
❑ Jordan is divided into four main physiographic regions:

1. **Jordan Rift Valley & Wadi Araba:** Below sea level (-400 m), Winter: 19–22°C | Summer: 38–39°C, Very limited rainfall
2. **Highlands:** Elevation: 600–1,500 m, Rainfall: 350–500+ mm/year, Winter: 9–13°C / Summer: 26–29°C
3. **Arid Zone (Plains):** Elevation moderate, rainfall: 200–350 mm/year, semi-arid conditions.
4. **Badia (Eastern Desert):** Covers ¾ of Jordan, low rainfall (<200 mm/year), Winter: 14-16°C / Summer: 35-37°C.



Jordan." Global Yield Gap Atlas, Wageningen University & Research, https://www.yieldgap.org/jordan. Accessed 18 June 2025.

❑ Institutional Roles in Vector-Borne Disease Surveillance

1. **Ministry of Health (MOH):** Human surveillance, indicator-based surveillance systems and vectors surveillance (via malaria control program).
2. **Ministry of Agriculture (MOA):** Animal disease reporting, passive surveillance.
3. **Jordan CDC:** Data integration, research, interagency coordination.

Notifiable Vector borne diseases in MOH (Required by Law):	Notifiable Vector-Borne Diseases in MOA (Required by Law):	
Leishmaniasis	Crimean-Congo Hemorrhagic Fever	Bovine Anaplasmosis
Malaria	Bluetongue Virus Infection	Bovine Babesiosis
Schistosomiasis	Equine Encephalomyelitis (Eastern)	Theileriosis
Rickettsiosis	Rift Valley Fever	African Horse Sickness (AHS)
	Japanese Encephalitis	Leishmaniasis (Animal)
	Surra (Trypanosoma evansi)	Nipah Virus Encephalitis
	West Nile Fever	Equine Infectious Anemia

- **Ministry of heath /Reported VBDs in Jordan (2008–2024): Cases and Incidence Rates per 100,000**

Disease	Type	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cutaneous Leishmaniasis	Cases	244	148	155	136	109	144	180	257	281	354	152	72	23	56	38	89	96
	IR/100k	4.2	2.5	2.5	2.2	1.7	2.2	2.7	3.8	3.9	3.6	1.5	0.7	0.2	0.5	0.2	0.8	0.8
Malaria*	Cases	45	50	61	58	117	56	102	59	51	44	41	56	16	38	44	46	64
	IR/100k	0.8	0.8	1	0.9	1.8	0.8	1.5	0.9	0.8	0.5	0.4	0.5	0.1	0.3	0.4	0.4	0.5
Schistosomiasis /Bilharziasis*	Cases	0	0	0	0	0	0	1	0	1	5	1	0	0	12	28	24	25
	IR/100k	2.2	2	1.3	2.1	1.3	0.7	0.7	0.8	0.4	0.5	0.3	0.4	0.2	0.1	0.3	0.2	0.2
Rickettsiosis	Cases	0	0	0	0	0	0	5	0	23	11	27	13	5	9	4	10	15
	IR/100k	0	0	0	0	0	0	0.1	0	0.3	0.1	0.3	0.1	0.05	0.1	0.04	0.09	0.1

*Note: All detected cases are imported and have originated outside of Jordan.

Ministry of Health - Jordan. (2024). *Annual Statistical Report of Communicable Diseases 2024*. Retrieved from https://www.moh.gov.jo/ebv4.0/root_storage/ar/eb_list_page/التقرير_الاحصائي_السنوي_للامراض_السارية_2024.pdf

❑ Possible risk factors associated with vector born diseases in Jordan:

1. Climate Change & Temperature Rise:

- Since 1961, minimum temperatures have risen 0.4–2.8 °C, maximum by 0.3–1.8 °C
- Heatwaves are becoming longer and more intense.
- Annual precipitation has decreased by 5–20%, rainy days dropped 3–10%
- By 2050, average temperatures are expected to climb 2–4 °C and up to 4.5 °C by 2080
- Rapid urbanization and inadequate drainage in low-lying areas have significantly increased flash flood risks in Jordan.
- Hot extremes will hit arid regions hardest, especially the eastern Badia (desert) and Rift Valley.

Red Cross Climate Centre. (2024). Country profile: Jordan. Retrieved June 19, 2025, from https://www.climatecentre.org/wp-content/uploads/RCCC-Country-profiles-Jordan-2024_final.pdf
Weathering Risk (2024). Climate Risk Profile: Jordan. Retrieved June 19, 2025, from https://weatheringrisk.org/sites/default/files/document/Climate_Risk_Profile_Jordan.pdf

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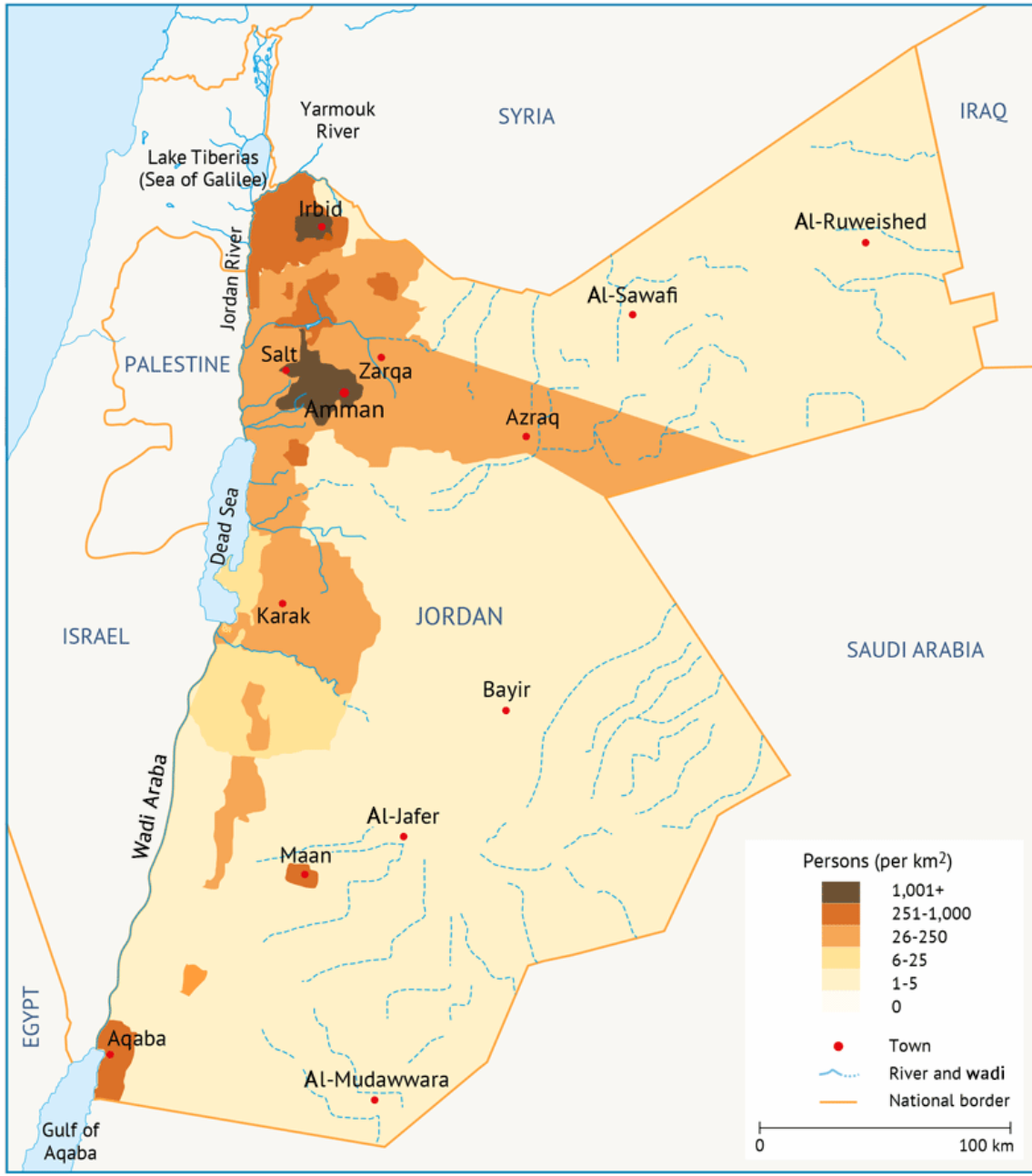
2. Population growth/ Refugees:

- Jordan’s population grew from 400,000 in 1946 to over 10 million by 2020.
- Large-scale of refugee influxes increase pressure on housing, sanitation, and health infrastructure.
- Refugee populations account for more than 10% of Jordan's total residents.
- Rapid urban growth leads to overcrowded areas.



Water in Jordan. Fanack Water, www.water.fanack.com/jordan/. Accessed 19 June 2025.

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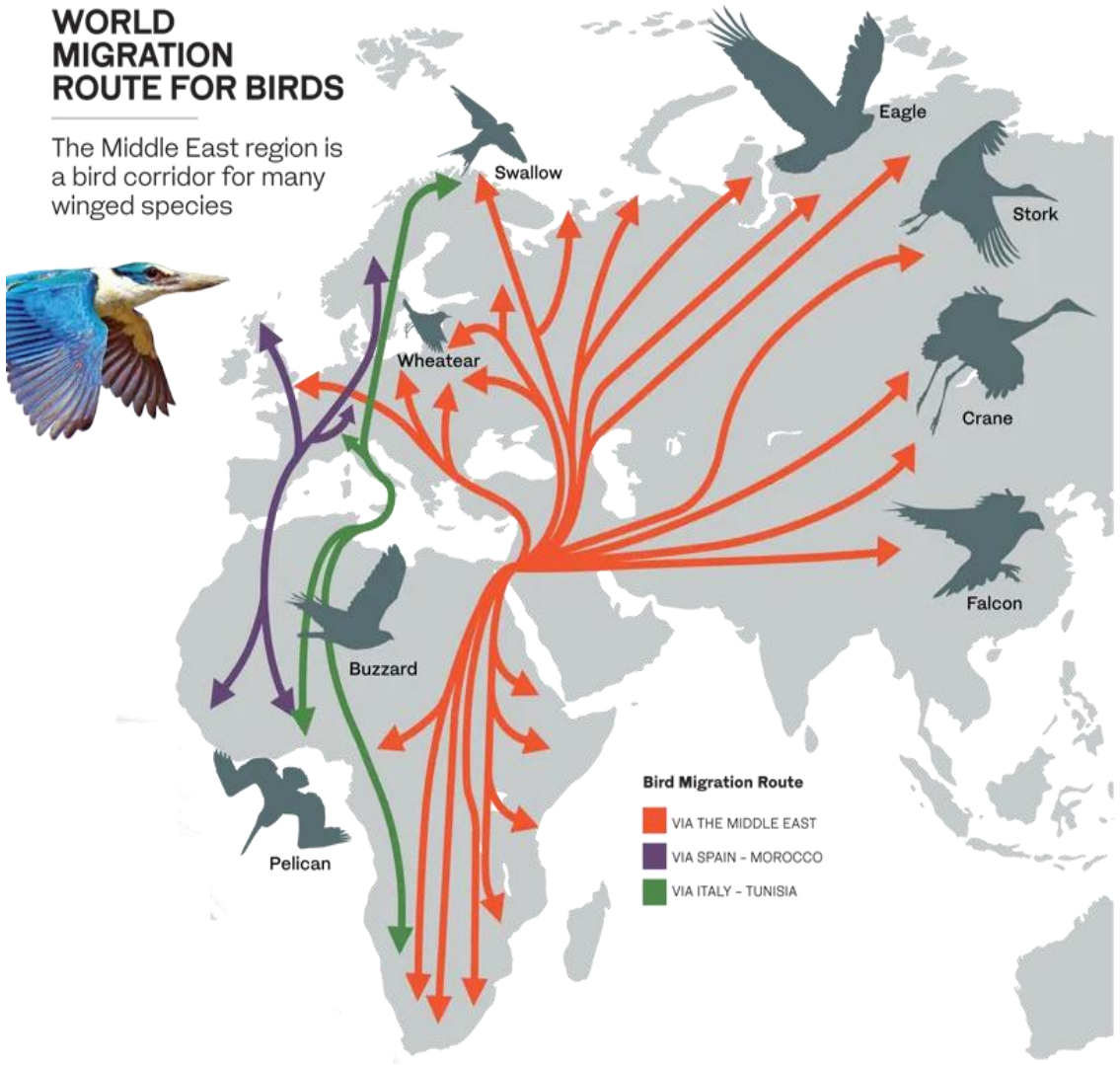
3. Wild birds migration:

- Jordan is a vital migration route for birds from all three continents (as in the picture).
- Rift Valley / Red Sea flyway is the 2nd most important global route for migratory soaring birds (Approximately 1.5 million birds migrate annually along this flyway).
- Jordan serves as a key landing and resting site for many migratory birds.



Birdwatching in Jordan." PathsofJordan.net, www.pathsofjordan.net/birdwatching-in-jordan. Accessed 19 June 2025.

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4. Cross-bordering and regional outbreaks:

a) Cutaneous leishmaniasis (CL):

- Cutaneous leishmaniasis is endemic in the region.
- Refugees contributed to 45% of positive cases in Jordan in 2016.

b) Crimean-Congo hemorrhagic fever (CCHF):

- Jordan has not reported any cases of CCHF in decades (JCDC).
- Ongoing outbreaks in Iraq with 33 confirmed human cases in 2021 rise to 511 confirmed human cases in 2023.
- First reported in Israel in September 2024, detected in cattle and cattle ticks.
- Turkey, Iran, Uzbekistan, Russia, and Eastern Europe also experience frequent CCHF outbreaks.

Alhawarat, Mohammad et al. “Trend of Cutaneous Leishmaniasis in Jordan From 2010 to 2016: Retrospective Study.” JMIR public health and surveillance vol. 6,1 e14439. 24 Mar. 2020, doi:10.2196/14439
Imperial College London World Health Organisation Collaborating Centre. (2024, June 20). Crimean-Congo Haemorrhagic Fever (CCHF) necessitates One Health treatment and vaccination.
Israel Ministry of Health. (2024, October 18). Crimean–Congo Hemorrhagic Fever (CCHF). Retrieved from https://www.gov.il/en/pages/disease-cchf

c) West Nile Virus:

- First confirmed human case in Jordan (2024)
- Over 930 reported cases and 73 deaths In 2024 in Israel and approximately 300 cases and 15 fatalities in Palestinian.
- Major outbreaks occurred along key bird migration routes in countries like Greece, Romania, Russia.

d) Rift Valley Fever:

- no reported cases in Jordan.
- Major outbreaks in Sudan 1973 and Egypt 1977 then re-emerged in 1993.
- Cases also reported in Saudi Arabia and Yemen.

e) Other diseases:

- Bluetongue diseases.
- Dengue Virus.

Ministry of Health – Jordan. (2024, July 29). تسجيل أول حالة إصابة بحمى غرب النيل في الأردن. https://www.moh.gov.jo/Ar/NewsDetails/الصحة_تسجيل_أول_حالة_إصابة_بحمى_غرب_النيل_في_الأردن
Ministry of Health – Israel. West Nile Fever – Disease Guide. Government of Israel, www.gov.il/en/pages/disease-west-nile-fever?chapterIndex=8. Accessed 20 June 2025.
World Health Organization. (2017, October 3). West Nile virus. https://www.who.int/news-room/fact-sheets/detail/west-nile-virus
Mariner, J. (2018). Rift Valley Fever Surveillance. FAO Animal Production and Health Manual No. 21. Rome: Food and Agriculture Organization of the United Nations (FAO).

5. Seroprevalence studies on humans or animals confirm exposure, (exposure location unknown).

- West Nile virus IgG seroprevalence was 8.61% among 988 human samples in Jordan (Obeidat et al., 2018)
- West Nile virus IgG antibodies were detected in 24.9% of 227 horses in Jordan (Almashagbah et al., 2013).
- Rift Valley Fever virus Seroprevalence was 3% among 989 tested dairy cattle, sheep, and goats in Jordan (Alkafajei et al., 2021).
- Crimean-Congo Hemorrhagic Fever virus (CCHFV) seroprevalence was 14% among 989 tested dairy cattle, sheep, and goats in Jordan (Alkafajei et al., 2021).
- Dengue virus seroprevalence was 24.6% among 892 participants in Jordan (Obeidat & Roess, 2018).

Obeidat, B., et al. "Seroprevalence of West Nile Virus among Humans in Jordan: A National Serosurvey." Zoonoses and Public Health, vol. 66, no. 2, 2018, pp. 127–132. https://doi.org/10.1111/zph.12545

Almashagbah, F., et al. "Prevalence of West Nile Virus Antibodies in Horses in Jordan." Journal of Equine Veterinary Science, vol. 33, no. 12, 2013, pp. 1112–1115. https://doi.org/10.1016/j.jevs.2013.03.005

Alkafajei, A., et al. "Rift Valley Fever and Crimean-Congo Hemorrhagic Fever Viruses in Jordan: A Serosurvey of Humans and Animals." Pathogens, vol. 10, no. 1, 2021, p. 69, https://doi.org/10.3390/pathogens10010069.

Obeidat, B., Roess, A., et al. (2018). First report on seroprevalence and risk factors of dengue virus in Jordan. PLoS ONE, 13(12), e0208715. https://doi.org/10.1371/journal.pone.0208715

6. Other factors:

- Lack of sufficient financial support to carry out activities related to surveillance and control of vector-borne diseases.
- Need for specialized laboratory equipment and training for workers in the laboratories of concerned institutions.
- Prioritizing government support and research for epidemic diseases that show higher prevalence in Jordan, such as measles in humans and foot-and-mouth disease in cattle.
- Insufficient number of entomology experts.
- Need for proper training of workers on classifying disease-transmitting vectors.
- Need for additional studies on the spread of vector-borne diseases, their prevalence, and their susceptibility to pesticides.

❑ Initiatives by Jordan Center For Diseases Control (JCDC):

- **Completed:**

- Conducted national risk assessment to prioritize public health threats, including vector-borne diseases.
- Formed national multi-sectoral rapid response teams with defined emergency roles.
- Organized inter-sectoral training on CCHF and MERS-CoV with Iraqi counterparts, in collaboration with Johns Hopkins and Georgetown universities.
- **Ongoing:**
- National vector control needs assessment with World Health Organization (WHO).
- Preparing epidemiological study on mosquito-borne diseases in collaboration with National Reference Center for Veterinary Epidemiology (IZS).

Research to conduct an epidemiological survey study of mosquito-borne diseases in Jordan

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- **Why This Study Matters??**
- Emerging diseases in the region (e.g., West Nile Virus).
- Detection of the invasive vector species Aedes albopictus occurred in 2016
- Gaps in vectors surveillance beyond malaria program (limited locations).
- Cross-border risks from neighboring outbreak.

- **Objectives:**
- Conduct national risk analysis to identify high-risk areas and vulnerable populations for arbovirus transmission.
- Implement seroprevalence surveys in humans and animals in high-risk zones to assess exposure.
- Identify mosquito vector species in targeted zones and screen mosquitoes for arboviruses if needed
- **Methodology - Phase 1: Risk Assessment**
- Analyze existing data on human/animal arbovirus cases, mosquito populations, climate, and migratory birds.
- Use spatial mapping and consult stakeholders (Ministries of Health, Agriculture, academia and other) to identify priority surveillance zones.

- **Methodology - Phase 2: Seroprevalence Surveys**

- Collect human blood samples focusing on occupationally exposed groups and high-risk area residents.
- Sample animals (ruminants, equines, wild birds) coordinated with Ministry of Agriculture and conservation groups.
- Record movements, environmental and any other effective factors.
- Laboratory test using validated serological assays (IgG/IgM) and RT-PCR for confirmation.

- **Methodology - Phase 3: Entomological Surveillance**

- Deploy mosquito traps (CDC light traps, BG-Sentinel, BG lure attractants, etc.) in selected locations for adult and perform larval collection.
- Identify species morphologically and/or via molecular methods (RT-PCR if needed).
- Detect arboviral RNA in mosquitoes depending on feasibility and prior results.

- **Expected Outcomes**

- Risk map highlighting vulnerable zones for arboviral outbreaks.
- Baseline seroprevalence data on arbovirus exposure in humans and animals.
- Identification of mosquito vectors beyond malaria program coverage.
- Recommendations for targeted vector control and surveillance.
- Strengthened intersectoral collaboration and national capacity for arbovirus surveillance and outbreak response.

Key Messages & Takeaways

- Jordan faces increasing risk of VBDs due to climate and mobility factors.
- Need for intersectoral surveillance and rapid response capacity.
- Ongoing research and mapping will inform targeted control efforts.
- International collaboration is essential for regional disease security.

Thank You