Risk analysis of the occurrence of avian influenza virus (AI) in Mali with the GIS-based Multicriteria decision analysis (GIS-MCDA)

We intend to evaluate the occurence of avian influenza viruses in Mali by using the GIS-MCDA method. The aim of this form is to determine the main risk factors contributing to the occurence of AI in Mali as well as their relative importance and relations with the risk of AI.

* Indicates required question

1. Name and Surname - Functions *

Risk factors for the occurence of AI

According to certain studies realized in Africa, risk factors listed below contribute to the occurence of AI.
In your opinion are these risk factors important for avian influenza in Mali?

2. Poultry density *

Mark only one oval.

- Yes
- No

3. Population density *

Mark only one oval.

- Yes
- No

4. Proximity to poultry markets *

Mark only one oval.

- Yes
- No

5. Proximity to main roads *

Mark only one oval.

- Yes
- No

6. Proximity to open waters *

Mark only one oval.

- Yes
- No

7. Other risk factors

Determining the importance of risk Factors

In this section you should estimate the relative importance of each risk factor compared to other risk factors in relation to its contribution to the risk of occurrence of AI in Mali.

8. 1. Poultry density is a risk factor *

5 = Much more important than 3 = Moderately more important than 1= Equally important as 1/3 = Moderately less important than 1/5 = Much less important than

Mark only one oval per row.

	Much more important than (5)	Moderately more important than (3)	Equally important as (1)	Moderately less important than (1/3)	Much less important than (1/5)
Population density					
Proximity to poultry markets					
Proximity to main roads					
Proximity to opens waters					

9. 2. Population density is a risk factor *

5 = Much more important than 3 = Moderately more important than 1= Equally important as 1/3 = Moderately less important than 1/5 = Much less important than

Mark only one oval per row.

	Much more important than (5)	Moderately more important than (3)	Equally important as (1)	Moderately less important than (1/3)	Much less important than (1/5)
Poultry density					
Proximity to poultry markets					
Proximity to main roads					
Proximity to opens waters					

10. 3. Proximity to poultry markets is a risk factor *

5 = Much more important than 3 = Moderately more important than 1= Equally important as 1/3 = Moderately less important than 1/5 = Much less important than

Mark only one oval per row.

	Much more important than (5)	Moderately more important than (3)	Equally important as (1)	Moderately less important than (1/3)	Much less important than (1/5)
Poultry density	◯	◯	◯	◯	◯
Population density	◯	◯	◯	◯	◯
Proximity to main roads	◯	◯	◯	◯	◯
Proximity to opens waters	◯	◯	◯	◯	◯

11. 4. Proximity to main roads is a risk factor *

5 = Much more important than 3 = Moderately more important than 1= Equally important as 1/3 = Moderately less important than 1/5 = Much less important than

Mark only one oval per row.

	Much more important than (5)	Moderately more important than (3)	Equally important as (1)	Moderately less important than (1/3)	Much less important than (1/5)
Poultry density					
Population density					
Proximity to poultry markets					
Proximity to opens waters					

12. 5. Proximity to opens waters *

5 = Much more important than 3 = Moderately more important than 1= Equally important as 1/3 = Moderately less important than 1/5 = Much less important than

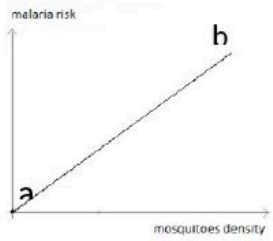
Mark only one oval per row.

	Much more important than (5)	Moderately more important than (3)	Equally important as (1)	Moderately less important than (1/3)	Much less important than (1/5)
Poultry density	◯	◯	◯	◯	◯
Population density	◯	◯	◯	◯	◯
Proximity to poultry markets	◯	◯	◯	◯	◯
Proximity to main roads is a risk factor	◯	◯	◯	◯	◯

Relations between risk factors and the occurrence of Avian Influenza

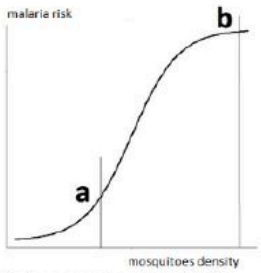
Illustration by examples of the possible relationships between risk factors and the occurrence of AI.

RELATIONSHIP 1: malaria risk is proportionately increasing with density of Anopheles mosquitoes



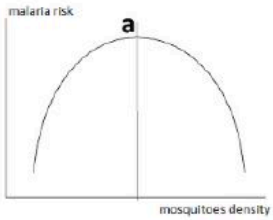
The risk of spread is minimal (=0) if the mosquitoes' density is below 20/km2 (threshold "a"). The risk is maximal (=1) if density is > 100/km2 (threshold "b"). Between these 2 thresholds, the risk is increasing proportionately (linear function).

RELATIONSHIP 2: malaria risk is increasing with density of Anopheles mosquitoes, and especially between threshold "a" (example: very low density) and threshold "b" (example: very high density). It remains constant thereafter



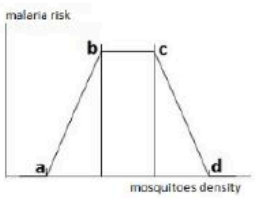
The risk of spread is minimal (=0) if the mosquitoes' density is below 20/km2 ("a"). The risk is maximal (=1) if density is > 100/km2 ("b"). Between these 2 thresholds, the risk is increasing following a sigmoidal function. Beyond the threshold "b", the risk remains constant (=1).

RELATIONSHIP 3: malaria risk is increasing with density of Anopheles mosquitoes up to a threshold "a", and decreases thereafter



The risk of malaria spread is minimal when density is <20 mosquitoes/km2 and is increasing up to a threshold "a" where density is 100 mosquitoes/km2. Beyond this threshold, the risk is decreasing until reaching 0 when density is > 2000 mosquitoes/km2. This may be explained by the biology of Anopheles, (a greater density may imply competition/changes in feeding habits, etc.)

RELATIONSHIP 4: malaria risk increases with density of mosquitoes between thresholds "a" and "b". The risk remains constant between thresholds "b" and "c". It decreases from thresholds "c" to "d".



The risk is minimal if the mosquitoes' density is below 20/km2 (threshold "a"). The risk is maximal (=1) if density is between 100 and 1000 mosquitoes/km2 (thresholds "b" and "c"). Beyond 1000 mosquitoes/km2, the risk is decreasing until reaching 0 (minimal risk) when density is > 5000 mosquitoes/km2 (threshold "d"). Again, this may be explained by the biology of Anopheles.

13. 1. Poultry density has a relationship... *

Mark only one oval.

- Relationship 1
- Relationship 2
- Relationship 3
- Relationship 4

14. What could be the values of a and b (if "relationship 4 " the values of c and d)?

15. 2. Population density has a relationship... *

Mark only one oval.

- Relationship 1
- Relationship 2
- Relationship 3
- Relationship 4

16. What could be the values of a and b (if "relationship 4 " the values of c and d)?

_____

17. 3. Proximity to poultry markets has a relationship... *

Mark only one oval.

- Relationship 1
- Relationship 2
- Relationship 3
- Relationship 4

18. What could be the values of a and b (if "relationship 4 " the values of c and d)?

_____

19. 4.Proximity to main roads has a relationship... *

Mark only one oval.

- Relationship 1
- Relationship 2
- Relationship 3
- Relationship 4

20. What could be the values of a and b (if "relationship 4 " the values of c and d)?

21. What is the risk in terms of proportion (%) of the risk linked to the proximity of the roads that could be attributed to primary and secondary roads?

22. 5. Proximity to open waters has a relationship... *

Mark only one oval.

- Relationship 1
- Relationship 2
- Relationship 3
- Relationship 4

23. What could be the values of a and b (if "relationship 4 " the values of c and d)?

24. Do you have any comments about the study?

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