

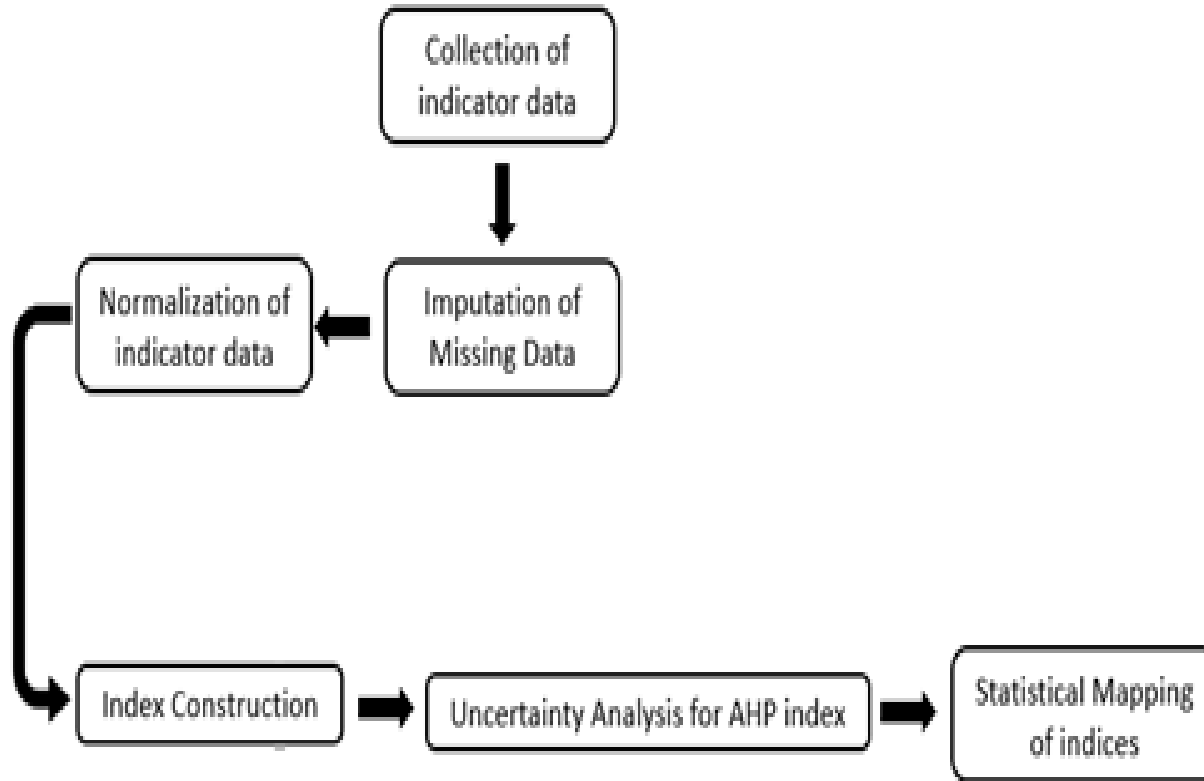
MAPPING OF VECTOR-BORNE DISEASE (VBD) HOTSPOTS IN THE PHILIPPINES: CONSTRUCTING A VBD VULNERABILITY INDEX USING AHP

Dating, Mark Jay P.
INSTAT-UPLB

Objectives

- to determine the exposure of Philippine provinces to factors that make them vulnerable to VBD using a composite disease vulnerability index
 1. determine provinces in the Philippines with high VBD vulnerability using AHP
 2. assess validity of the constructed VBD vulnerability index

Methodology



AHP (Saaty, 1970)

- comparing by pair all factors involved

$$\underline{C} = \begin{bmatrix} 1 & r_{12} & r_{13} & r_{14} \\ 1/r_{12} & 1 & r_{23} & r_{24} \\ 1/r_{13} & 1/r_{23} & 1 & r_{34} \\ 1/r_{14} & 1/r_{24} & 1/r_{34} & 1 \end{bmatrix}$$

$$CR = \frac{CI}{RI}$$

$$VBDVI_i = \sqrt[6]{\prod_{j=1}^6 (DI_{i,j} + 0.00001)} - 0.00001$$

Methodology: Robustness of VBDVI

$$\bar{r}_{Ai} = \frac{\sum_{j=1}^N |r_{oi} - r_j|}{N}$$

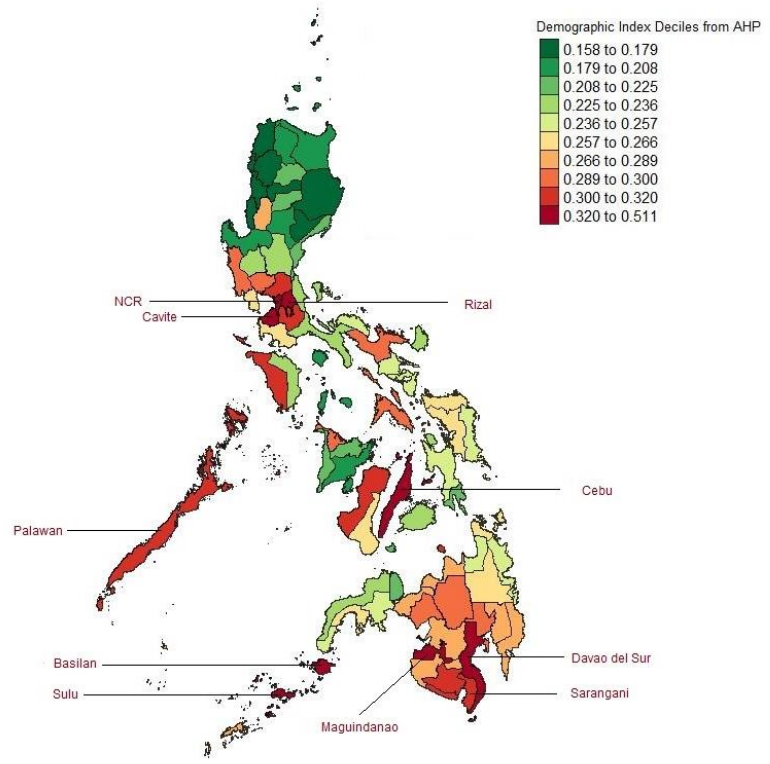
- to investigate if the rank of the province changed after modification
 1. Removing an indicator
 2. Modifying the weights of the dimension
 3. Comparison to actual VBD rates

Results

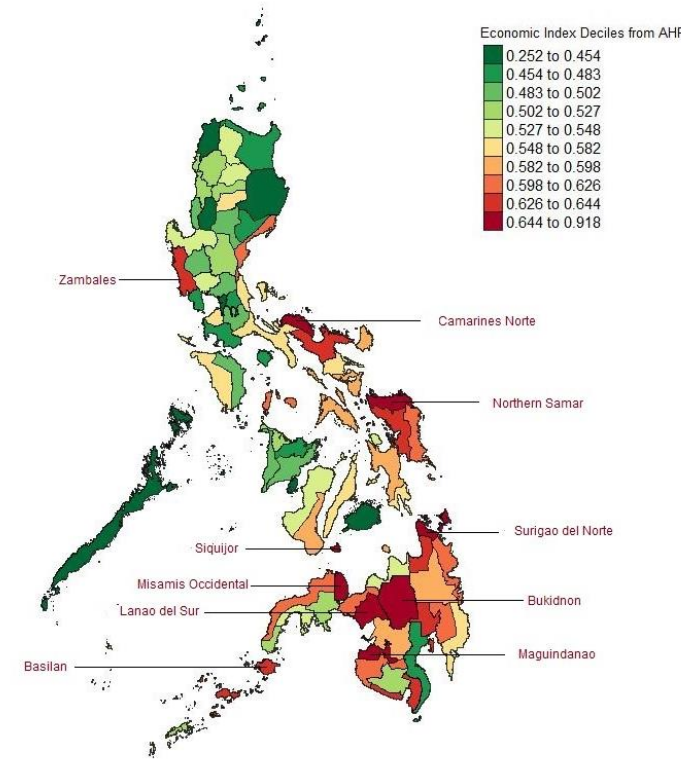
Dimension	Indicators with high weights
Demographic	number of persons living in an area, population density
Economic	financial capacity of the population
Disease Dynamics	crowding, land use for agricultural activities
PH and Healthcare	presence of primary care services and hospitals
Infrastructure	community infrastructures (road and energy)
Governance	good governance and competitiveness

Results

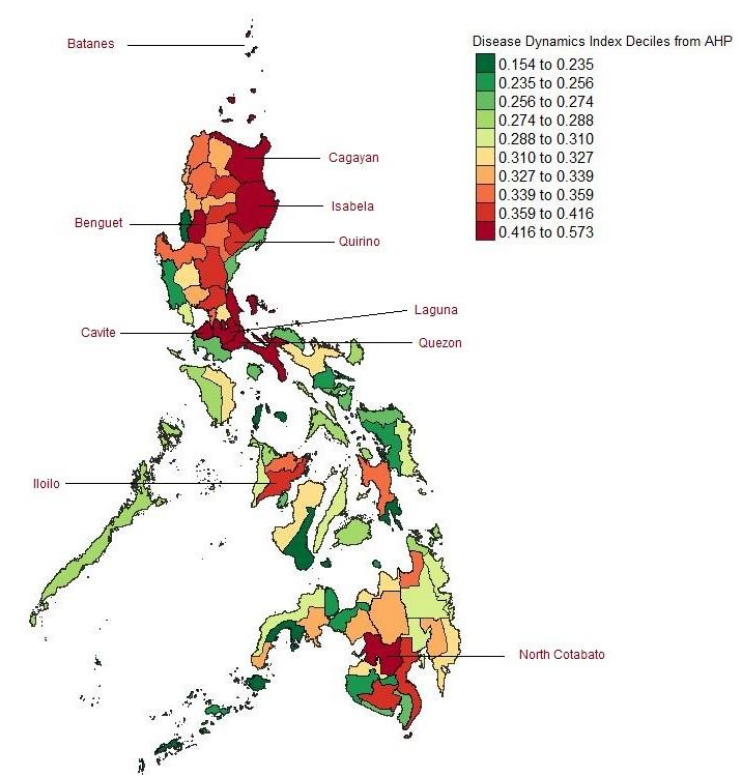
Demographic



Economic

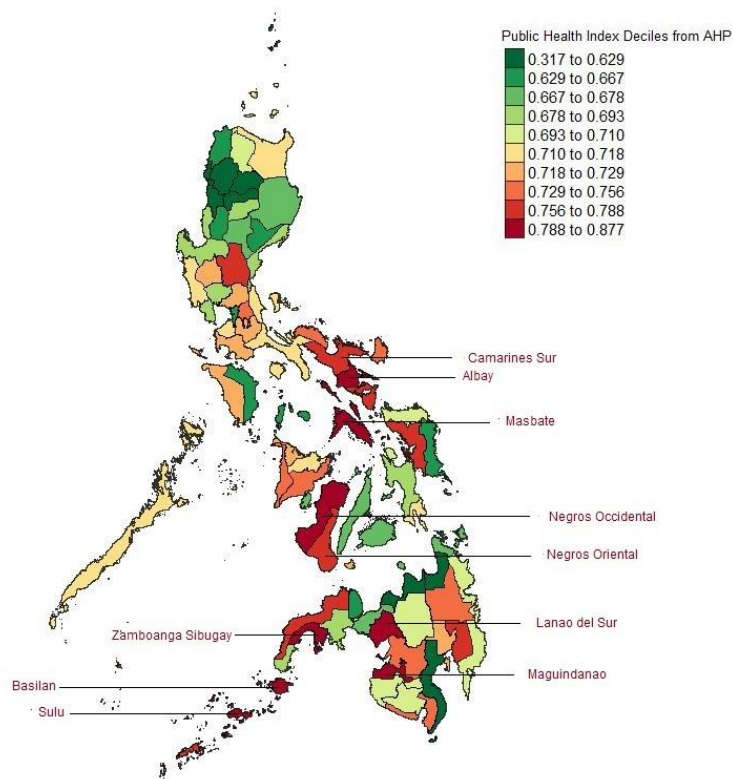


Disease Dynamics

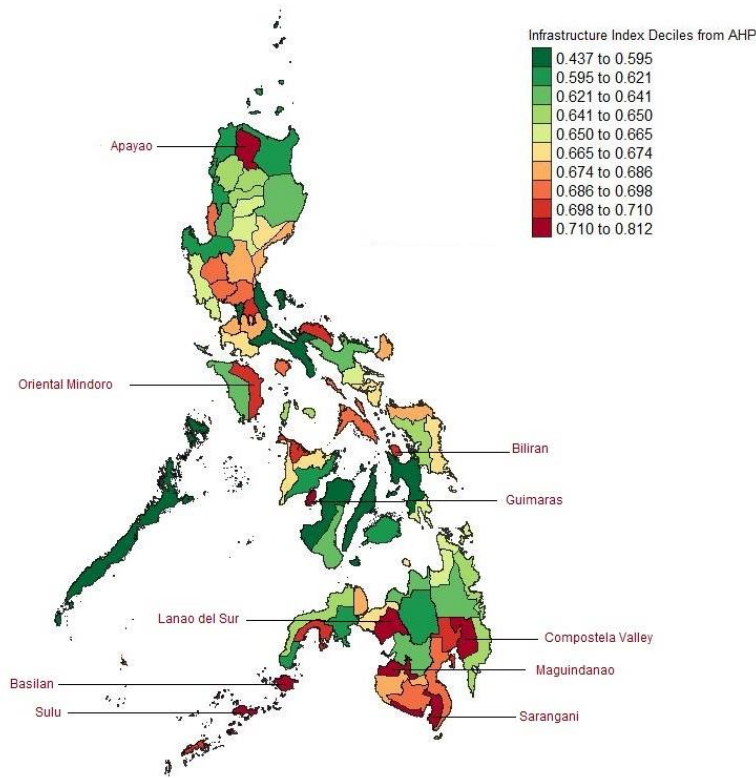


Results

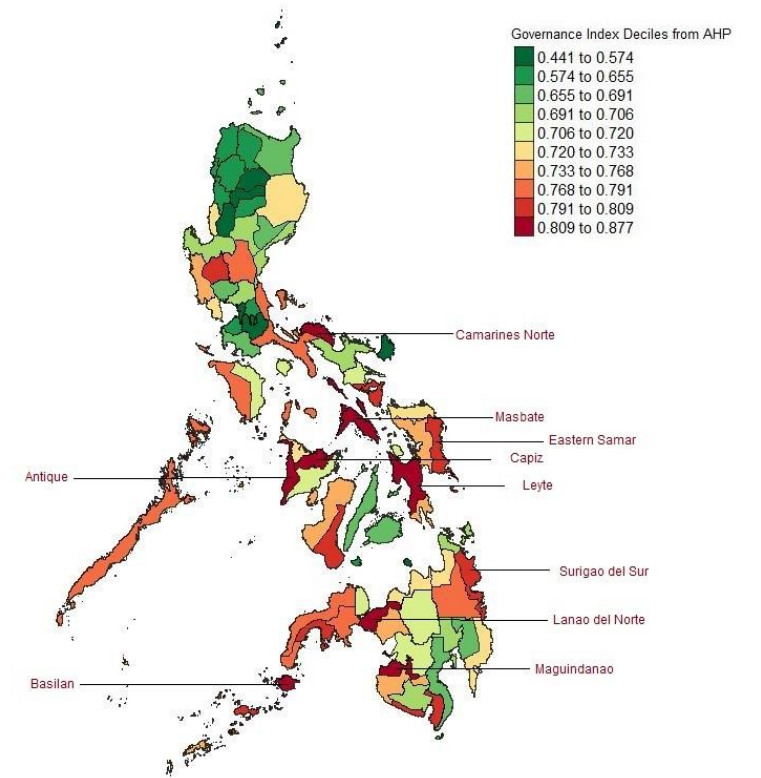
PH & Healthcare



Infrastructure

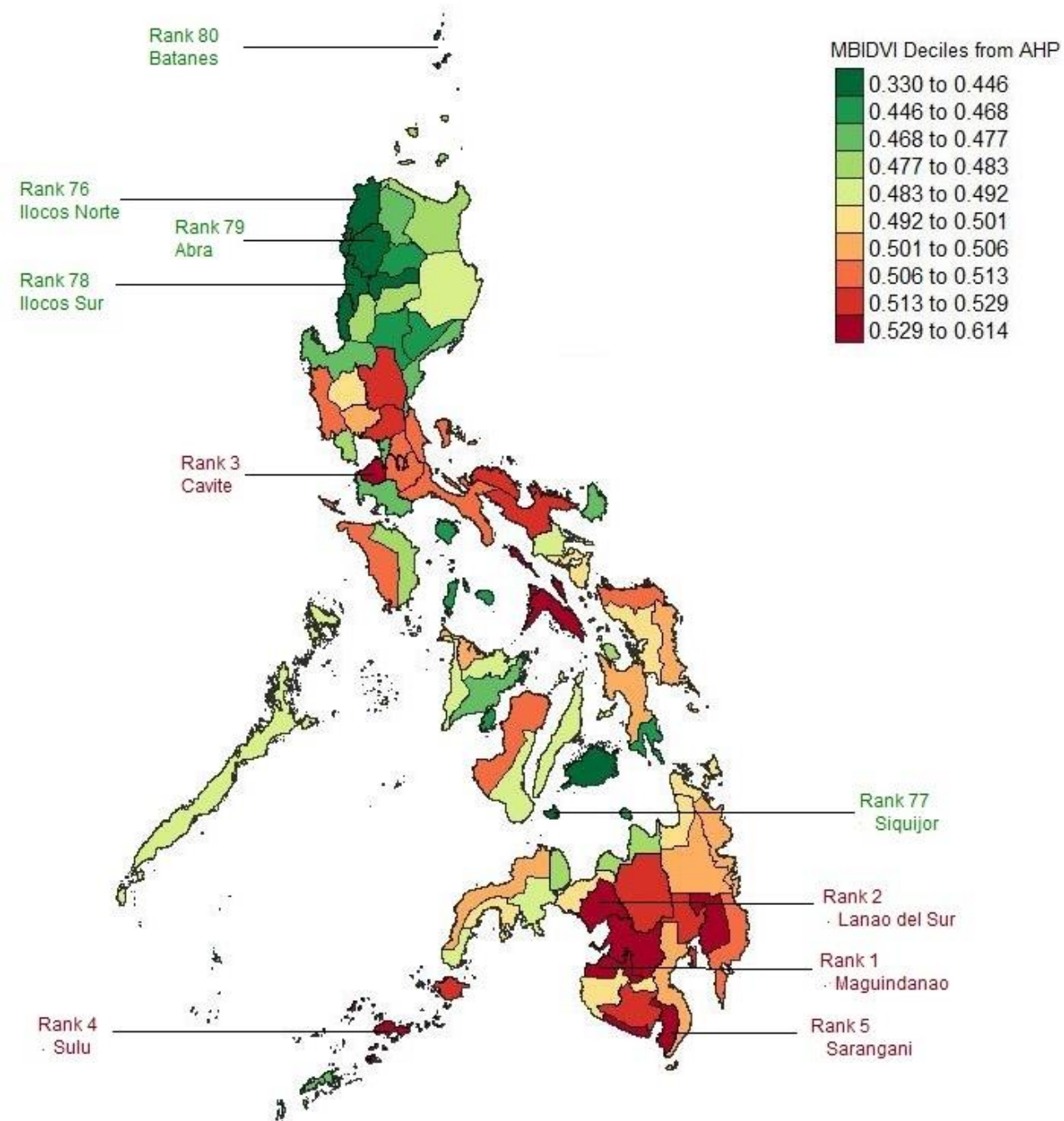


Governance

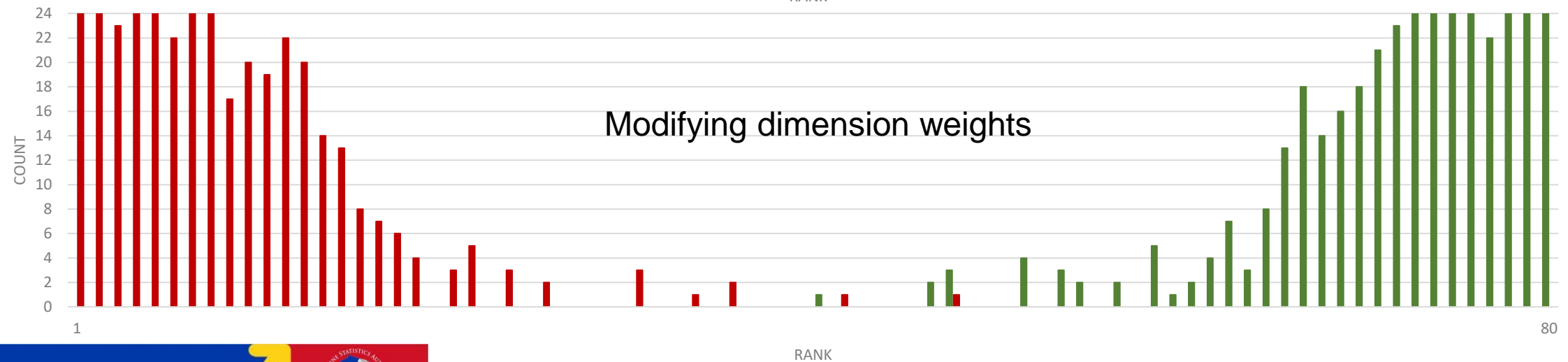
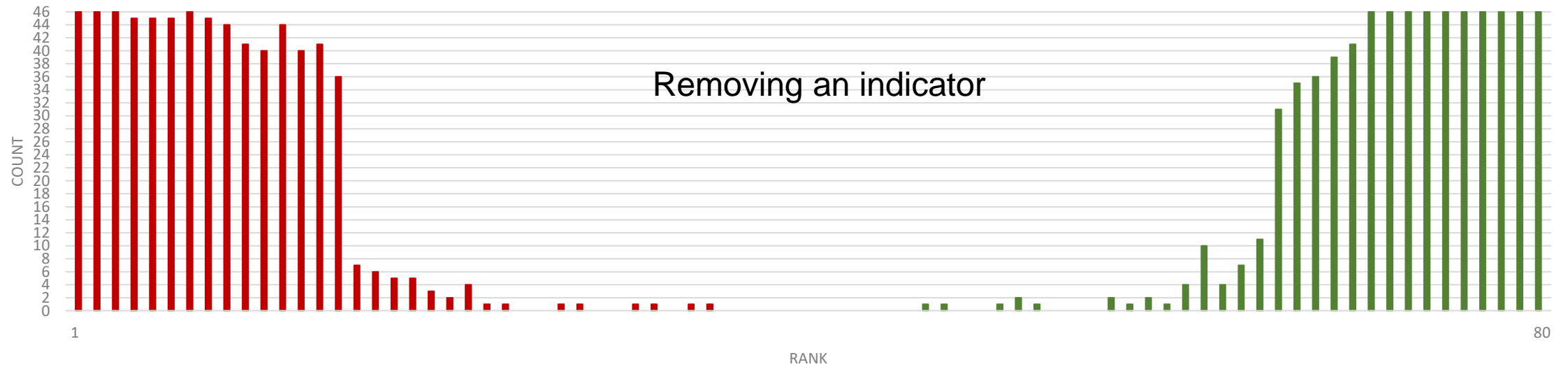


Results

MOST VULNERABLE			LEAST VULNERABLE		
Rank	Province	Index	Rank	Province	Index
1	Maguindanao *	0.6142	66	Kalinga	0.4634
2	Lanao del Sur *	0.5953	67	Nueva Vizcaya	0.4626
3	Cavite	0.5562	68	Quirino @	0.4624
4	Sulu *	0.5458	69	Romblon	0.4619
5	Sarangani *	0.5447	70	Marinduque	0.4573
6	North Cotabato	0.5428	71	Southern Leyte	0.4506
7	Masbate	0.5385	72	Guimaras	0.4464
8	Compostela Valley *	0.5352	73	Bohol *	0.4388
9	Basilan *	0.5281	74	La Union	0.4300
10	Bukidnon	0.5232	75	Mountain Province	0.4266
11	Bulacan	0.5220	76	Ilocos Norte	0.4247
12	Davao del Norte	0.5219	77	Siquijor *	0.4238
13	Camarines Sur @	0.5206	78	Ilocos Sur	0.4237
14	South Cotabato	0.5195	79	Abra	0.4191
15	Camarines Norte	0.5187	80	Batanes	0.3304



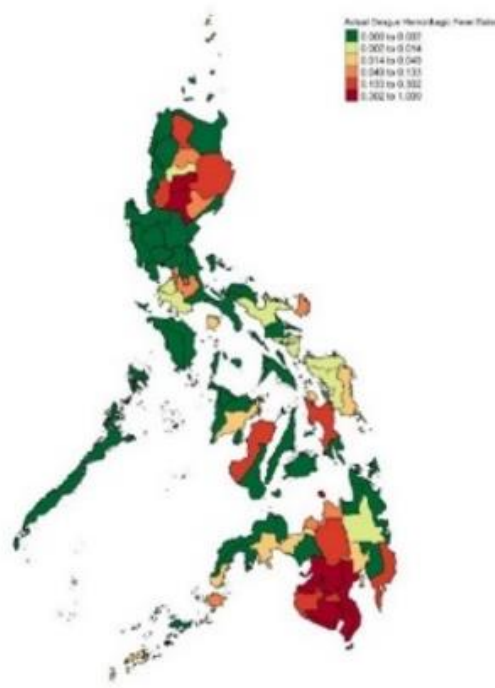
Robustness of VBDVI



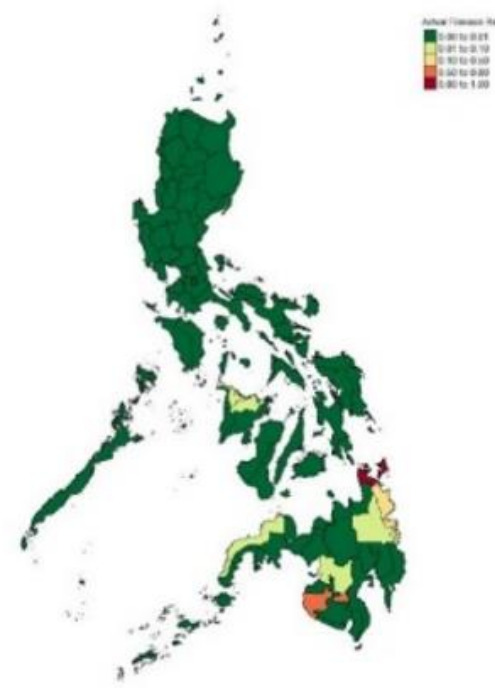
Robustness of VBDVI



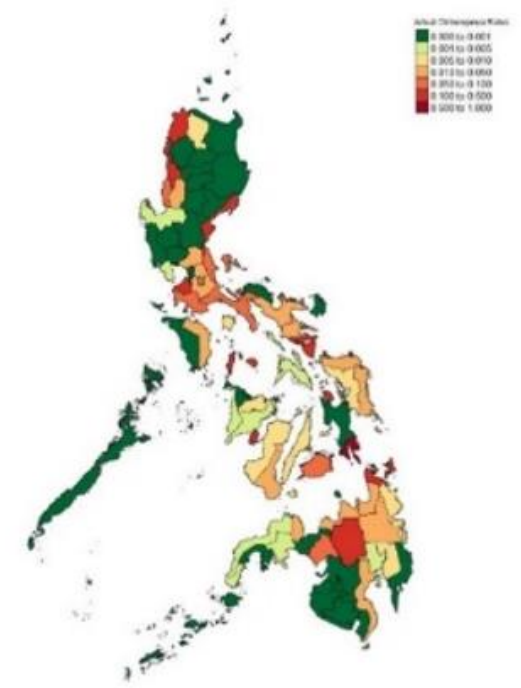
Malaria
1.89%



DHF
2.47%



Filariasis
1.52%



Chikungunya
3.15%

Conclusion

- Aggregating dimensions showed Maguindanao as the most vulnerable province.

Dimension	Most Vulnerable	Rank of Maguindanao
Demographic	NCR (0.5110)	2 (0.4247)
Economic	Lanao del Sur (0.9183)	4 (0.7071)
Disease Dynamics	Isabela (0.5731)	37 (0.3127)
PH and Healthcare	Lanao del Sur (0.8765)	4 (0.8535)
Infrastructure	Sarangani (0.8124)	4 (0.7635)
Governance	Maguindanao (0.8771)	

- Mindanao is a potential hotspot of VBD.

Conclusion

- PH and healthcare indicators as well as governance indicators appeared to cause high vulnerability measures to provinces. Poor measures of indicators caused high vulnerability.
- Good measurements of indicators under demographic and disease dynamics dimensions can keep a province safer from VBD.
- VBDVI is robust even when indicators were removed and dimension weights were altered. However, VBDVI can classify more effectively most vulnerable provinces compared to least vulnerable.
- Use of more regularly published official statistics can be beneficial to investigate trend of vulnerability while recalibrating VBDVI with more important indicators.