

Manuscript ID number:

391933

Title of paper:

Rapid appraisals of the transformation strategy required to sustain Dengue vector control during and after the COVID-19 pandemic in Indonesia

Ethical/Copyright Corrections:

• Please confirm in the revised manuscript that the interview participants provided informed consent, which also included publication of anonymized responses.

If you have any queries regarding the ethic requirements, please view our Frequently Asked Questions:

https://www.dovepress.com/cr_data/ethics-faq-2019.pdf

Editorial Corrections:

• Figure Files: Please supply all figures in high quality .jpg, .tif or .pdf format, one file for each figure (eg, Fig 1, Fig 2, etc). This should include the figure artwork but not the figure legends. If the figures have also been placed in your manuscript, please remove these. Please note that the figure legends must not be placed within the figure artwork and should instead be listed at the end of the manuscript file. See the figure page on our website for further details (<https://www.dovepress.com/author-guidelines/figures-tables>).

• Tables: Please move all tables, their legends and table footnotes to the end of the manuscript following the reference list or to a separate word document.

You have cited both tables as Table 1. Please amend accordingly on the revised manuscript.

Response Letter:

A Response to Reviewers letter is required upon resubmission.

We require every comment by the reviewers to be addressed by the authors. Please note, if you feel that some of the reviewer comments will not add value to your manuscript, you do not have to make those particular changes. You may instead respond to the comment in your letter, explaining why you do not agree with or have not made the suggested changes.

Please indicate where in your revised manuscript the changes (as applicable) can be seen. The response letter is used by the Editor to make a decision on whether to accept the manuscript, and so it is vital that every comment is responded to.

Please ensure copies of all figures/tables/supplementary material are provided with the revised manuscript, even if these are not altered during the revisions so we can ensure we have the most up to date file for each.

Reviewer Comments:

Reviewer 1

Title & Abstract

1. Do the title and abstract cover the main aspect of the work?

The manuscript discusses the transformation or changes happening in the dengue vector control during the COVID-19 pandemic in Indonesia. The title and abstract have properly captured the main findings and points of the paper, entail the aim and outcome appropriate for the study.

2. Does the introduction provide background and information relevant to the study?

The information on the technical meshwork on vector control is properly explained in the study. However, I would like to suggest the authors provide more background on the prevalence rate or any other epidemiological data on dengue, particularly with its changes in the COVID-19 pandemic era. You could refer to the following article on the dengue trend during the pandemic, in South East Asia (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8769803/>)

Material and Methods

3. Are the methods clear and replicable? Do all the results presented match the methods described?

The methods are clear and concise and consist of policy review, social media analysis on Twitter, and interviews with health officials, particularly the dengue program officer at the primary health center. The results are also consistent with the predetermined method.

Results

4. If relevant are the results novel? Does the study provide an advance in the field? Is the data plausible?

The results are quite novel, particularly in analyzing the dengue vector control program in the pandemic era, from its changes and transformative method to its difficulties and challenges. However, as it is conducted through "tweet" analysis and interviews, the result might be found subjective. The data, thus might not be the most objective, however might serve as a preliminary study.

Discussion

5. Do the findings described by the author correlate with the results? Are the findings relevant?

The findings are quite consistent and relevant. The findings discuss the evident rising case of dengue from the perspective of the layperson, along with testimonies from health officials in their respective regions.

Conclusion

6. Do the conclusions correlate to the results found?

The conclusions is relevant to the results, as it summarizes the qualitative analysis finding of the survey.

Figures & Tables

7. If the author has provided figures and tables are the figures and tables clear and legible? Are the figures free from unnecessary modification?

The figures are suitable for publication.

8. Does the paper raise any concerns?

The paper is a novel analysis of the policy review and the changes in programs during the pandemic. The references are relevant with interesting analysis. I would believe there are no concerns on the similarities with other paper.

Competing interest

9. Do any of the authors' competing interests raise concerns about the validity of the study i.e. have the authors' competing interests created a bias in the reporting of the results and conclusions?

There are no conflict of interest from the authors.

Recommendations to the Editor

Additional comments

Please add analysis on the dengue prevalence in the respective region or from the available database. It would be interesting to see the effect of the program change, in particular, due to the challenges. Is the program effectiveness considered good or heavily influenced due to all the limitations.

Reviewer 2

Title & Abstract

1. Do the title and abstract cover the main aspect of the work?

The title and abstract cover the message conveyed by the manuscript, where they seek to change the strategy for effective control of Dengue vector.

2. Does the introduction provide background and information relevant to the study?

More citations and a little more information would be more useful like <https://www.who.int/news/item/07-09-2020-dengue-control-three-year-indonesia-trial-shows-promising-results> may also be discussed, different control approaches can be discussed and why the authors feel that their discussed approach is most relevant of all.

Material and Methods

3. Are the methods clear and replicable? Do all the results presented match the methods described?

Methods are clear and replicable

Results

4. If relevant are the results novel? Does the study provide an advance in the field? Is the data plausible?

The study is important and deserves publication

Discussion

5. Do the findings described by the author correlate with the results? Are the findings relevant?

Yes they do

Conclusion

6. Do the conclusions correlate to the results found?

Yes they do

Figures & Tables

7. If the author has provided figures and tables are the figures and tables clear and legible? Are the figures free from unnecessary modification?

Yes they are ok however figure resolution is not clear. the images are not clear.

8. Does the paper raise any concerns?

No
NO
YES
YES
NO

Competing interest

9. Do any of the authors' competing interests raise concerns about the validity of the study i.e. have the authors' competing interests created a bias in the reporting of the results and conclusions?

NO

Recommendations to the Editor

Additional comments

More citations and a little more information would be more useful like <https://www.who.int/news/item/07-09-2020-dengue-control-three-year-indonesia-trial-shows-promising-results> may also be discussed or Brady OJ, Kharisma DD, Wilastonegoro NN, O'Reilly KM, Hendrickx E, Bastos LS, Yakob L, Shepard DS. The cost-effectiveness of controlling dengue in Indonesia using wMel Wolbachia released at scale: a modelling study. BMC Med. 2020 Jul 9;18(1):186. doi: 10.1186/s12916-020-01638-2. PMID: 32641039; PMCID: PMC7346418, may also be discussed, different control approaches can be discussed and why the authors feel that their discussed approach is most relevant of all.

Besides the images in the manuscript are not clear, authors should work on their resolution

1 ORIGINAL RESEARCH

2 **Rapid appraisals of the transformation strategy required**
3 **to sustain Dengue vector control during and after the**
4 **COVID-19 pandemic in Indonesia**

5 Sulistyawati Sulistyawati^{1*}

6 Herman Yuliansyah²

7 Tri Wahyuni Sukesi¹

8 Arfiani Nur Khusna²

9 Surahma Asti Mulasari¹

10 Fatwa Tentama³

11 Bambang Sudarsono⁴

12 Fanani Arief Ghozali⁵

13

14 ¹Faculty of Public Health, Universitas Ahmad Dahlan, Yogyakarta, Indonesia;

15 ²Department of Informatics, Faculty of Industrial Technology, Universitas Ahmad Dahlan,

16 Yogyakarta, Indonesia;

17 ³Faculty of Psychology, Universitas Ahmad Dahlan, Yogyakarta, Indonesia;

18 ⁴Department of Automotive Technology Vocational Education, Faculty of Teacher Training and
19 Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia;

20 ⁵Department of Electronics Engineering Vocational Education, Faculty of Teacher Training and
21 Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia.

22

23 Correspondence: Sulistyawati Sulistyawati

24 Faculty of Public Health, Universitas Ahmad Dahlan. Kampus 3, Jln Prof. Dr. Soepomo,

25 Janturan, Umbulharjo, Yogyakarta, Indonesia

26 Tel +6281 7040 2693

27 Email: sulistyawati.suyanto@ikm.uad.ac.id

28

29

30

31

32 **Abstract:**

33 **Purpose:** This research aimed to observe the gap for improvement in dengue vector control during
34 COVID-19, considering two stakeholders: the government and society. We formulated two
35 research questions: 1) How is the government managing dengue vector control during the COVID-
36 19 pandemic? 2) What is the situation of dengue disease, its vectors, and vector control in the
37 community?

38 **Methods:** This study uses multiple approaches: policy review, social listening using Twitter
39 analysis, and interviews. A policy review was employed to capture the journey of dengue vector
40 control in Indonesia from dengue found in Indonesia until the COVID-19 pandemic. Twitter data
41 captured public opinions through social media about dengue and vector control. Interviews involved
42 program implementers that consider knowing the situation in the field of dengue and its vector
43 control. The informant was selected through purposive sampling.

44 **Results:** To control dengue disease, the Indonesian government has released regulations about
45 dengue vector control that adjusts the COVID-19 situation. But vector control is still not running
46 optimally, resulting in the data supply for policy not running well.

47 **Conclusion:** Dengue cases continued during the COVID-19 pandemic, even in some places stated
48 an outbreak occurred. Vector control does not work correctly during the COVID-19 pandemic due
49 to social restrictions. It is recommended to encourage the implementation of community
50 empowerment through one house, one jumantik, which is equipped with self-reporting to mitigate
51 and respond to similar situations as the pandemic.

52 **Keywords:** Dengue, COVID-19, vector control, policy, pandemic

53 **Introduction**

54 Dengue is a vector-borne disease caused by the dengue virus carried by the *Aedes aegypti*
55 mosquito¹. This disease is still a big problem in tropical countries, including Indonesia, which is
56 known to be endemic to this disease. WHO stated that in 2020 – the year that COVID-19 began to
57 spread – several countries, including Indonesia, reported an increase in dengue cases². This
58 indicates that with the emergence of COVID-19, a new challenge in handling dengue disease can

59 even be said to be a double burden for countries that have previously struggled to eradicate
60 dengue³. Several studies indicate that during COVID-19, one of which stated that the number of
61 dengue cases decreased by approximately 16% during the COVID-19 pandemic⁴. Reports from
62 some ASEAN countries in 2020 followed a similar pattern: the number of dengue cases in 2020
63 was lower than in 2019. One of them is Indonesia, where cases were twice as high in 2019 as the
64 previous year (137,760), while it was reported to have decreased in 2020 (95,893)⁵. Furthermore,
65 this needs to be investigated further whether it is due to the lockdown effect so that there is no
66 interaction with positive hosts or underreporting cases^{6,7} or because of people reluctant to health
67 seeking.

68 Referring to the existing health system in Indonesia, the Indonesian government adopted
69 a decentralized system. In this context, health programs, including dengue control, are broadly
70 designed by the center and then carried out at lower levels to be adjusted to the context of the
71 region, including in the budget allocation⁸. If we look further, the dengue program in Indonesia is
72 carried out by two main stakeholders, namely the government as a regulator and the community
73 as both the subject and object of the dengue program⁹. The government and its staff's domain is
74 to create appropriate programs based on data and implement them with the community.

75 Indonesia takes vector control through community empowerment in vector monitoring
76 because this program is considered more efficient and offers sustainability¹⁰. Vector monitoring is
77 a vital part of vector surveillance which becomes evidence-based for determining the distribution,
78 density, and larval habitats^{11,12}. In Indonesia, vector surveillance is conducted through the Jumantik
79 program, a squad monitoring the existence of larvae by entering the house in the society^{10,13}.
80 Jumantik cadre collects and reports the data in the field periodically to the village, which is
81 forwarded to the health center to calculate the larva indices, including house index, breteau index,
82 and container index, which are considerations in making vector control policies. The role of vector
83 monitoring activity in policy development is presented in Figure 1.

84 So far, the Jumantik program as vector surveillance has been running well. Nevertheless,
85 problems arise when COVID-19 blows, and the government implements social and physical
86 distancing to limit interaction to avoid COVID-19 transmission. The social restriction impacts the

87 absence of door-to-door larva inspection by the Jumantik cadre. On the other hand, this data is an
88 essential source for determining dengue prevention measures in the community. Based on all
89 backgrounds, we observed the gap for improvement in dengue vector control during COVID-19
90 from 2 stakeholders, namely the government and society (Figure 2). We formulated two research
91 questions: 1) How is the government managing dengue vector control during the COVID-19
92 pandemic? 2) What is the situation of dengue disease, its vectors, and vector control in the
93 community?

94 **Material and methods**

95 ***Study Design***

96 This study uses multiple approaches: policy review, social listening using Twitter analysis, and
97 interviews. A policy review was employed to capture the journey of dengue vector control in
98 Indonesia. Twitter data figured out the public opinions about dengue and vector control. Interviews
99 involved dengue program implementers that were selected through purposive sampling. The
100 informant in this study was the person in charge of the dengue program at the primary health center
101 and health office, who was responsible for vector control in society and bridged communication to
102 the health office related to proper dengue intervention in a particular area.

103 ***Data Source, Data Collection, Sample, and Analysis***

104 The data collection process is summarized in Table 1. We did this research through multiple
105 approaches: policy review, social listening via Twitter, and interview.

106 ***Ethical Consideration***

107 The ethical approval was given by Universitas Ahmad Dahlan Ethical Board
108 (#012205052). Inform consent was obtained before the interview started. The informant was
109 informed that all analyses performed would be anonymized for publication purposes.

110 Results

111 **1. Policy Review**

112 These policy reviews were conducted to draw the journey of dengue prevention in
113 Indonesia. This review was a development from previous research conducted by
114 Sulistyawati (2020)⁹, which was added to the latest policy by the Indonesian government
115 in controlling dengue vectors during the COVID-19 pandemic¹⁴ (Figure 3).

116 To control dengue, Indonesia has chosen to control the dengue vector in several ways:
117 chemistry, physics, and biology. However, since 1992, chemical control has been gradually
118 reduced and focused on vector control through the movement of cleaning mosquito nests.
119 In 2015 (5 years before the pandemic), the government released the one house one
120 jumantik program, which actively involved the community responsible for cleaning larvae
121 in mosquito breeding sites at their home. Once COVID-19 exploded, the government
122 issued a regulation to adapt to the situation; subsequently, the one house-one Jumantik
123 program was forced with social distancing.

124 **2. Social listening analysis from Twitter**

125 A total of 7,419 yields from Twitter. After screening duplicates, we got 2,411 tweets
126 included in the analysis. Table 2 summarizes our social listening analysis conducted
127 through Twitter data showing that dengue is still a big problem during the COVID-19
128 pandemic.

129 Many people provide awareness of dengue because cases in their area are increasing with
130 some types of statements, such as being in dengue season and dengue increase because
131 of overcrowding of population density.

132 *"Dengue cases in Bengawan city increased sharply in the middle of this year."*

133

134 *"The population density in South Jakarta and the shady temperature are the reasons for*
135 *dengue cases rising (in this location)."*

136

137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178

"Looks like now the dengue season again; my friend is also hospitalized because of dengue; I hope he gets well soon."
"Dengue case increasing, Bekasi city government asks the public to be aware."

The category of illness found in society is an abstraction to articulate that dengue incidents still occurred during COVID-19. This was captured from the survivor's Tweet and those who told us the situation around him.

"I went to Bandung when I wasn't feeling well and ended up with dengue yesterday."
"From these symptoms, it's clear I was attacked by dengue; I hope I'm not hospitalized."
"Yesterday, on Eid al-Adha, I brought my sister to be treated for dengue..."

Next is the category mortality and outbreak occurred, which comes from two subcategories: some dengue patients die, and dengue outbreaks arise in some places. This category illustrates that fatalities happened and, in some areas, declared a dengue outbreak.

"Dengue fever case in Asmat Regency has risen dramatically in the past month; the Asmat Regency Government has determined an outbreak of dengue fever."
"DBD cases in the Yogyakarta City soared as long as two patients died"
"Many cases of dengue in Solo, some of them die."

During COVID-19, people said they felt anxiety about dengue because of the pain and trauma of experiencing dengue in the past. So, they were afraid of getting infected again; even when they felt dengue symptoms, they were worried.

"In the next few days, hopefully, it won't be fever anymore because if I still have a fever, I have to go for the blood test. I'm afraid of getting dengue for the second time."
"On Monday last week, I was shocked because of a fever; I was afraid of dengue. But after checking in the hospital, thank God I'm fine."
"Friends, if you have a brother or nephew who has a fever and red spots appear on the skin and tongue, please run to the hospital immediately."

In addition, people expressed their afraid of the pain and symptoms of dengue. They also spoke about concerns or fears with the presence of mosquitoes. However, they did not specifically mention *Aedes aegypti*.

179
180
181
182
183
184
185
186
187

"Many mosquitoes make me sick with dengue; I'm suspicious about getting dengue again."

"In the first month of class, I got dengue because there were a lot of mosquitoes in my class."

"Because I got dengue some time ago, I'm terrified of mosquitoes, afraid to open the window, and I always put mosquito repellents."

188
189

The last category is that dengue prevention is still being carried out during COVID-19, either educating the public or carrying out actual activities such as fogging.

190
191
192
193
194
195
196
197
198

"In order to prevent the spread of dengue fever, mass fogging activities are carried out in the Singgi environment of the Gulling House."

"The Papua Provincial Health Office (Dinkes) is intensifying counseling on preventing the transmission of dengue fever."

"An integrated team from Petojo Selatan village, Gambir sub-district, Central Jakarta, held an eradication of mosquito nests (PSN)."

199

3. Gap Identified and Interview

200
201
202
203
204

From two processes of data collection, namely policy review and social listening via Twitter, several problems in dengue control during the COVID-19 pandemic; namely, dengue still occurs in the community during COVID-19. This result was confirmed by an interview informant, a dengue program implementer at the primary health centers, who stated that dengue persisted during COVID-19.

205
206
207
208

(During COVID-19) Dengue still occurs even though they have decreased compared to 2019. In our PHC, they were 62, 48, and 12 cases for 2019, 2020, and 2021 respectively." (Female, PHC dengue officer)

209
210
211

Although the government has issued regulations to prevent dengue during the pandemic, it is not running optimally in society. It was confirmed from the interview with a dengue officer at a primary health center.

212
213
214
215
216
217

"(During the pandemic) eradication of mosquito nests (PSN) runs by prioritizing social distancing, but superficially...because Jumantik coordinator only monitors containers outside the house, containers inside the house were asked to the owner. For reporting per house (one house one Jumantik) by homeowners, some reporting some not – usually they reported using WA" (Female, PHC dengue officer)

218 Even though the eradication of mosquito nests is trying to be carried out during the
219 pandemic, still, the impact does not have a maximal effect on policy because the manual
220 reporting system cannot run normally. As a result, the data that is the basis for evidence-
221 based policymaking is not well provided. Dengue officers confirmed this at the PHC and
222 the provincial health office.

223 *"The larva inspection report was working (during the pandemic); the larva free number*
224 *was also calculated but cannot be used as a reference because it does not represent the*
225 *situation on the field" (Female, PHC dengue officer).*

226
227 *"Reporting of larva inspection does not stop during the pandemic, but the quantity was*
228 *decreased. So, larva free rate (ABJ) cannot be calculated" (Male, Provincial dengue*
229 *officer)*

230

231 **Discussion**

232 Dengue, which is still globally exacerbated by the spread of COVID-19 that has implications
233 for social restrictions, has become a severe problem in Indonesia's routine dengue vector control
234 programs. During the COVID-19 pandemic, the government enforced vector control by
235 emphasizing social distancing. However, this doesn't seem to be running well either. Seeing this
236 situation, the gap for improvement during COVID-19 in dengue vector control in Indonesia remains
237 unclear. Identifying the dengue situation and the vector control works during a pandemic will
238 facilitate the development of the innovation and may improve responses to currently available
239 interventions.

240 We want to know the gap for improvement between expectation and reality in dengue
241 vector control during the pandemic seen by the government and society. Through a combination of
242 policy review and social listening that triangulate with an interview, we identified that the Indonesian
243 government had issued a regulation on vector control during the pandemic. However, dengue
244 cases still occur in some locations, and even in some locations, outbreaks were declared. Vector
245 control does not run optimally due to social restrictions, so larva inspection reports cannot be used
246 as a reference in decision-making.

247 The dengue case during the pandemic still existed, although it tends to decrease in
248 quantity, this was confirmed by social listening via Twitter and approved by the dengue officer. This
249 result follows another study in Asia, India, Latin America, and Malaysia, which stated that dengue
250 cases during the COVID-19 pandemic decreased, presumably due to limited human movement.
251 Hence, the hosts stayed home, so they did not infect others^{6,7,15}. On the other hand, this decline in
252 cases should also be suspected to the public's reluctance to visit health facilities due to fear of
253 contracting COVID-19¹⁶. So it could be that the case looks slightly reduced because of the many
254 underreported cases⁶. However, different conditions were reported by several regions of Indonesia,
255 which stated there was an increase in dengue cases at the beginning of the COVID-19 pandemic,
256 including in Bali and East Java^{17,18}.

257 Regarding mosquitoes, this study shows people's complaints about the presence of
258 mosquitoes during COVID-19. People even said there were lots of mosquitoes around them and
259 even felt afraid because they had been infected with dengue. Several studies reported that the
260 COVID-19 pandemic, coupled with social restrictions, caused the increase in mosquito
261 densities^{19,20} due to the stop of dengue vector control movement. This means that the risk of
262 humans being bitten by mosquitoes also increases²¹. Accordingly, the mosquito population was
263 difficult to control then the population was increasing.

264 The complaint about the number of mosquitoes was related to the vector control
265 empowerment program not running effortlessly during the COVID-19 pandemic due to social
266 restrictions, as stated by previous research²². Social restriction policy also impacts disease control
267 policies and dengue vectors that rely on larvae inspection data that require entry into the house.
268 Since 2015 the Indonesian government has launched vector control through household-based
269 community empowerment (one house, one jumantik). Still, not all regions have implemented this
270 program – some are entering the socialization phase but have not yet implemented it. In regions
271 that have implemented one house-one jumantik, the data flow from households during the COVID-
272 19 pandemic was not correctly reported, so it is clear that the data supply for policies is disrupted.
273 Therefore, seeing the importance of vector control and the one house one jumantik program as an
274 effective community empowerment model, it is necessary to support an independent reporting

275 system at the household level. Thus, the flow of larva inspection data does not rely on manual
276 report form as has been done so far. This is undoubtedly a momentum to support vector control
277 programs during a pandemic or even after the pandemic as mitigation of similar conditions in the
278 future.

279 **Conclusion**

280 COVID-19 implies the dengue case and vector control. The society reported that Dengue disease
281 remain occurred during the pandemic. They also stated the existence of mosquitoes around them.
282 The social restriction is associated with disrupting routine vector control that runs inspection by
283 entering the house. This situation impacted the data supply for a policy generally referring to
284 societal larvae monitoring. We recommend developing one house one jumantik reporting system
285 as room for improvement of vector control in adaptation to COVID-19 and social restriction.

286 **Acknowledgments**

287 This study has received funding from the Ministry of Education and Culture, the Republic of
288 Indonesia, with grant number 030/PB.PDUPT/BRIn.LPPM/VI/2022. We thank Mrs. Arkana and Mr.
289 Regha from the health office of Yogyakarta for their helpful discussion during the research.

290 **Disclosure**

291 The author reports no conflicts of interest in this work.

292 **References**

- 293 1. WHO. Dengue and severe dengue [Internet]. Web. 2022 [cited 2022 Aug 22]. Available
294 from: <https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue>
- 295 2. WHO. Dengue and severe dengue [Internet]. Web. 2022 [cited 2022 Aug 14]. Available
296 from: <https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue>
- 297 3. Harapan H, Ryan M, Yohan B, Abidin RS, Nainu F, Rakib A, et al. Covid-19 and dengue:

- 298 Double punches for dengue-endemic countries in Asia. *Rev Med Virol.* 2021;31(2):1–9.
- 299 4. Khan S, Akbar SMF, Yahiro T, Mahtab M AI, Kimitsuki K, Hashimoto T, et al. Dengue
300 Infections during COVID-19 Period: Reflection of Reality or Elusive Data Due to Effect of
301 Pandemic. *Int J Environ Res Public Health.* 2022;19(17).
- 302 5. Wiyono L, Rocha ICN, Cedeno TDD, Miranda AV, Priso DEL. Dengue and COVID-19
303 infections in the ASEAN region: A concurrent outbreak of viral diseases. *Epidemiol Health.*
304 2021;43:1–5.
- 305 6. Chen Y, Li N, Lourenço J, Wang L, Cazelles B, Dong L, et al. Measuring the effects of
306 COVID-19-related disruption on dengue transmission in Southeast Asia and Latin
307 America: a statistical modelling study. *Lancet Infect Dis.* 2022 May 1;22(5):657–67.
- 308 7. Ong SQ, Ahmad H, Ngesom AMM. Implications of the COVID-19 lockdown on Dengue
309 transmission in Malaysia. *Infect Dis Rep [Internet].* 2021 Feb 1 [cited 2022 Aug
310 22];13(1):148. Available from: /pmc/articles/PMC7985789/
- 311 8. WHO. The Republic of Indonesia Health System Review [Internet]. Vol. 7, World Health
312 Organization. 2017. 64–105 p. Available from:
313 <http://apps.who.int/iris/bitstream/10665/254716/1/9789290225164-eng.pdf>
- 314 9. Sulistyawati S. Dengue Prevention and Control in Indonesia: A case study in Yogyakarta
315 City. Umeå University. Umeå University, Sweden; 2022.
- 316 10. Sulistyawati S, Astuti FD, Umniyati SR, Satoto TBT, Lazuardi L, Nilsson M, et al. Dengue
317 vector control through community empowerment: lessons learned from a community-
318 based study in Yogyakarta, Indonesia. *Int J Environ Res Public Health.* 2019;161013.
- 319 11. WHO. A review of entomological sampling methods and indicators for dengue vectors
320 [Internet]. Web. 2024 [cited 2022 Aug 23]. Available from:
321 <https://apps.who.int/iris/handle/10665/68575>
- 322 12. Li Y, Zhou G, Zhong S, Wang X, Zhong D, Hemming-Schroeder E, et al. Spatial
323 heterogeneity and temporal dynamics of mosquito population density and community
324 structure in Hainan Island, China. *Parasites and Vectors [Internet].* 2020 Sep 4 [cited 2022
325 Aug 23];13(1):1–11. Available from:

- 326 <https://parasitesandvectors.biomedcentral.com/articles/10.1186/s13071-020-04326-5>
- 327 13. Sulistyawati S, Mulasari SA, Sukei TW. Understanding community involvement on
328 Dengue prevention in Sleman, Indonesia: A free listing approach. *J UOEH*.
329 2020;42(3):231–6.
- 330 14. The Ministry of Health of Indonesia. About the Implementation of Dengue Prevention and
331 Control in the Covid-19 Pandemic Situation (Tentang Pelaksanaan Pencegahan dan
332 Pengendalian DBD dalam Situasi Pandemi Covid-19). Jakarta: Ministry of Health of
333 Republic Indonesia; 2020. p. 1–2.
- 334 15. Sharma H, Ilyas A, Chowdhury A, Poddar NK, Chaudhary AA, Abdul S, et al. Does COVID
335 - 19 lockdowns have impacted on global dengue burden ? A special focus to India. *BMC*
336 *Public Health* [Internet]. 2022;1–23. Available from: [https://doi.org/10.1186/s12889-022-](https://doi.org/10.1186/s12889-022-13720-w)
337 [13720-w](https://doi.org/10.1186/s12889-022-13720-w)
- 338 16. Mashudi DN, Ahmad N, Said SM. Level of dengue preventive practices and associated
339 factors in a Malaysian residential area during the COVID-19 pandemic: A cross-sectional
340 study. *PLoS One* [Internet]. 2022;17(4 April):1–15. Available from:
341 <http://dx.doi.org/10.1371/journal.pone.0267899>
- 342 17. Adnyana IMDM, Azhari FSS, Sudaryati NLG. Prevalence of Dengue Hemorrhagic Fever in
343 Bali from 2015 to 2020 and during the Covid-19 pandemic. *J Berk Epidemiol*.
344 2022;10(2):169–78.
- 345 18. Trisandy AY, Azmi Maruf M, Yudhastuti R, Lusno MFD, Notobroto HB. Large-scale social
346 restriction (LSSR) policy and dengue hemorrhagic fever cases during the Covid-19
347 pandemic in indonesia: A case study of five subregions of East Java province. *Kesmas*.
348 2021;16(1):49–52.
- 349 19. Daniel Reegan A, Rajiv Gandhi M, Cruz Asharaja A, Devi C, Shanthakumar SP. COVID-
350 19 lockdown: impact assessment on Aedes larval indices, breeding habitats, effects on
351 vector control programme and prevention of dengue outbreaks. *Heliyon* [Internet].
352 2020;6(10):e05181. Available from: <https://doi.org/10.1016/j.heliyon.2020.e05181>
- 353 20. Lu X, Bambrick H, Pongsumpun P, Dhewantara PW, Toan DTT, Hu W. Dengue outbreaks

354 in the covid-19 era: Alarm raised for Asia. PLoS Negl Trop Dis [Internet]. 2021;15(10):6–
355 11. Available from: <http://dx.doi.org/10.1371/journal.pntd.0009778>

356 21. Rahim MH, Dom NC, Ismail SNS, Mulud ZA, Abdullah S, Pradhan B. The impact of novel
357 coronavirus (2019-nCoV) pandemic movement control order (MCO) on dengue cases in
358 Peninsular Malaysia. One Heal [Internet]. 2021;12(October 2020):100222. Available from:
359 <https://doi.org/10.1016/j.onehlt.2021.100222>

360 22. Cavany SM, España G, Vazquez-Prokopec GM, Scott TW, Alex Perkins T. Pandemic-
361 associated mobility restrictions could cause increases in dengue virus transmission. PLoS
362 Negl Trop Dis. 2021;15(8):1–19.

363

364

365

366

Correction	Author response
Please confirm in the revised manuscript that the interview participants provided informed consent, which also included publication of anonymized responses.	Thank you for your comment, we already added information on page 4, line 108
Please remove your figure images from the manuscript file and submit them separately, as individual JPG, TIF or PDF files.	Thank you, We have separated the Figure and Table from the manuscript.

Your corrected files have been successfully submitted [ID: 391933]

1 message

Oliver Spence <Oliverspence@dovepress.com>
Reply-To: Oliver Spence <Oliverspence@dovepress.com>
To: Dr Sulistyawati <sulistyawati.suyanto@ikm.uad.ac.id>

Mon, Dec 19, 2022 at 9:20 AM

Dear Dr Sulistyawati,

Thank you for submitting your corrected revised manuscript and additional files. These have been uploaded successfully. We will continue processing the submission in the next few days, and will be in contact with an update once we have finished our remaining Editorial Checks.

We have received the following files:

- 19_Dec_2022_391933_Revised_Manuscript_for_corrections_1671416415.docx
- Response_to_correction.docx
- Table.docx
- Figure.docx

If you have any queries, or if there is a problem with any of the uploaded files, please contact us and we can help get it corrected.

Regards,
Oliver Spence
Revised Manuscript Co-ordinator
Oliverspence@dovepress.com
Dove Medical Press Ltd
Dove Medical Press is part of Taylor & Francis Group, the Academic Publishing Division of Informa PLC
(ID 391933)

1 ORIGINAL RESEARCH

2 **Rapid appraisals of the transformation strategy required**
3 **to sustain Dengue vector control during and after the**
4 **COVID-19 pandemic in Indonesia**

5 Sulistyawati Sulistyawati^{1*}
6 Herman Yuliansyah²
7 Tri Wahyuni Sukesi¹
8 Arfiani Nur Khusna²
9 Surahma Asti Mulasari¹
10 Fatwa Tentama³
11 Bambang Sudarsono⁴
12 Fanani Arief Ghozali⁵
13

14 ¹Faculty of Public Health, Universitas Ahmad Dahlan, Yogyakarta, Indonesia;

15 ²Department of Informatics, Faculty of Industrial Technology, Universitas Ahmad Dahlan,
16 Yogyakarta, Indonesia;

17 ³Faculty of Psychology, Universitas Ahmad Dahlan, Yogyakarta, Indonesia;

18 ⁴Department of Automotive Technology Vocational Education, Faculty of Teacher Training and
19 Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia;

20 ⁵Department of Electronics Engineering Vocational Education, Faculty of Teacher Training and
21 Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia.

22

23 Correspondence: Sulistyawati Sulistyawati

24 Faculty of Public Health, Universitas Ahmad Dahlan. Kampus 3, Jln Prof. Dr. Soepomo,
25 Janturan, Umbulharjo, Yogyakarta, Indonesia

26 Tel +6281 7040 2693

27 Email: sulistyawati.suyanto@ikm.uad.ac.id

28

29

30

31

Commented [S01]: Please place your figure legends at the end of the manuscript file.

Please also submit your figure images separately, as either JPG, TIF or PDF files.

32 **Abstract:**

33 **Purpose:** This research aimed to observe the gap for improvement in dengue vector control during
34 COVID-19, considering two stakeholders: the government and society. We formulated two
35 research questions: 1) How is the government managing dengue vector control during the COVID-
36 19 pandemic? 2) What is the situation of dengue disease, its vectors, and vector control in the
37 community?

38 **Methods:** This study uses multiple approaches: policy review, social listening using Twitter
39 analysis, and interviews. A policy review was employed to capture the journey of dengue vector
40 control in Indonesia from dengue found in Indonesia until the COVID-19 pandemic. Twitter data
41 captured public opinions through social media about dengue and vector control. Interviews involved
42 program implementers that consider knowing the situation in the field of dengue and its vector
43 control. The informant was selected through purposive sampling.

44 **Results:** To control dengue disease, the Indonesian government has released regulations about
45 dengue vector control that adjusts the COVID-19 situation. But vector control is still not running
46 optimally, resulting in the data supply for policy not running well.

47 **Conclusion:** Dengue cases continued during the COVID-19 pandemic, even in some places stated
48 an outbreak occurred. Vector control does not work correctly during the COVID-19 pandemic due
49 to social restrictions. It is recommended to encourage the implementation of community
50 empowerment through one house, one jumantik, which is equipped with self-reporting to mitigate
51 and respond to similar situations as the pandemic.

52 **Keywords:** Dengue, COVID-19, vector control, policy, pandemic

53 **Introduction**

54 Dengue is a vector-borne disease caused by the dengue virus carried by the *Aedes aegypti*
55 mosquito¹. This disease is still a big problem in tropical countries, including Indonesia, which is
56 known to be endemic to this disease. WHO stated that in 2020 – the year that COVID-19 began to
57 spread – several countries, including Indonesia, reported an increase in dengue cases². This
58 indicates that with the emergence of COVID-19, a new challenge in handling dengue disease can

59 even be said to be a double burden for countries that have previously struggled to eradicate
60 dengue³. Several studies indicate that during COVID-19, one of which stated that the number of
61 dengue cases decreased by approximately 16% during the COVID-19 pandemic⁴. Reports from
62 some ASEAN countries in 2020 followed a similar pattern: the number of dengue cases in 2020
63 was lower than in 2019. One of them is Indonesia, where cases were twice as high in 2019 as the
64 previous year (137,760), while it was reported to have decreased in 2020 (95,893)⁵. Furthermore,
65 this needs to be investigated further whether it is due to the lockdown effect so that there is no
66 interaction with positive hosts or underreporting cases^{6,7} or because of people reluctant to health
67 seeking.

68 Referring to the existing health system in Indonesia, the Indonesian government adopted
69 a decentralized system. In this context, health programs, including dengue control, are broadly
70 designed by the center and then carried out at lower levels to be adjusted to the context of the
71 region, including in the budget allocation⁸. If we look further, the dengue program in Indonesia is
72 carried out by two main stakeholders, namely the government as a regulator and the community
73 as both the subject and object of the dengue program⁹. The government and its staff's domain is
74 to create appropriate programs based on data and implement them with the community.

75 Indonesia takes vector control through community empowerment in vector monitoring
76 because this program is considered more efficient and offers sustainability¹⁰. Vector monitoring is
77 a vital part of vector surveillance which becomes evidence-based for determining the distribution,
78 density, and larval habitats^{11,12}. In Indonesia, vector surveillance is conducted through the Jumantik
79 program, a squad monitoring the existence of larvae by entering the house in the society^{10,13}.
80 Jumantik cadre collects and reports the data in the field periodically to the village, which is
81 forwarded to the health center to calculate the larva indices, including house index, breteau index,
82 and container index, which are considerations in making vector control policies. The role of vector
83 monitoring activity in policy development is presented in Figure 1.

84 So far, the Jumantik program as vector surveillance has been running well. Nevertheless,
85 problems arise when COVID-19 blows, and the government implements social and physical
86 distancing to limit interaction to avoid COVID-19 transmission. The social restriction impacts the

87 absence of door-to-door larva inspection by the Jumantik cadre. On the other hand, this data is an
88 essential source for determining dengue prevention measures in the community. Based on all
89 backgrounds, we observed the gap for improvement in dengue vector control during COVID-19
90 from 2 stakeholders, namely the government and society (Figure 2). We formulated two research
91 questions: 1) How is the government managing dengue vector control during the COVID-19
92 pandemic? 2) What is the situation of dengue disease, its vectors, and vector control in the
93 community?

94

95 **Material and methods**

96 ***Study Design***

97 This study uses multiple approaches: policy review, social listening using Twitter analysis, and
98 interviews. A policy review was employed to capture the journey of dengue vector control in
99 Indonesia. Twitter data figured out the public opinions about dengue and vector control. Interviews
100 involved dengue program implementers that were selected through purposive sampling. The
101 informant in this study was the person in charge of the dengue program at the primary health center
102 and health office, who was responsible for vector control in society and bridged communication to
103 the health office related to proper dengue intervention in a particular area.

104 ***Data Source, Data Collection, Sample, and Analysis***

105 The data collection process is summarized in Table 1. We did this research through multiple
106 approaches: policy review, social listening via Twitter, and interview.

107 ***Ethical Consideration***

108 The ethical approval was given by Universitas Ahmad Dahlan Ethical Board
109 (#012205052). Inform consent was obtained before the interview started. The informant was
110 informed that all analyses performed would be anonymized for publication purposes.

111 Results

112 **1. Policy Review**

113 These policy reviews were conducted to draw the journey of dengue prevention in
114 Indonesia. This review was a development from previous research conducted by
115 Sulistyawati (2020)⁹, which was added to the latest policy by the Indonesian government
116 in controlling dengue vectors during the COVID-19 pandemic¹⁴ (Figure 3).

117 To control dengue, Indonesia has chosen to control the dengue vector in several
118 ways: chemistry, physics, and biology. However, since 1992, chemical control has been
119 gradually reduced and focused on vector control through the movement of cleaning
120 mosquito nests. In 2015 (5 years before the pandemic), the government released the one
121 house one jumantik program, which actively involved the community responsible for
122 cleaning larvae in mosquito breeding sites at their home. Once COVID-19 exploded, the
123 government issued a regulation to adapt to the situation; subsequently, the one house-one
124 Jumantik program was forced with social distancing.

125 **2. Social listening analysis from Twitter**

126 A total of 7,419 yields from Twitter. After screening duplicates, we got 2,411 tweets
127 included in the analysis. Table 2 summarizes our social listening analysis conducted
128 through Twitter data showing that dengue is still a big problem during the COVID-19
129 pandemic.

130 Many people provide awareness of dengue because cases in their area are increasing with
131 some types of statements, such as being in dengue season and dengue increase because
132 of overcrowding of population density.

133 *"Dengue cases in Bengawan city increased sharply in the middle of this year."*

134
135 *"The population density in South Jakarta and the shady temperature are the reasons for*
136 *dengue cases rising (in this location)."*
137

138 *"Looks like now the dengue season again; my friend is also hospitalized because of*
139 *dengue; I hope he gets well soon."*

140
141 *"Dengue case increasing, Bekasi city government asks the public to be aware."*

142
143 The category of illness found in society is an abstraction to articulate that dengue
144 incidents still occurred during COVID-19. This was captured from the survivor's Tweet
145 and those who told us the situation around him.

146 *"I went to Bandung when I wasn't feeling well and ended up with dengue yesterday."*

147
148 *"From these symptoms, it's clear I was attacked by dengue; I hope I'm not hospitalized."*

149
150 *"Yesterday, on Eid al-Adha, I brought my sister to be treated for dengue..."*

151
152

153 Next is the category mortality and outbreak occurred, which comes from two subcategories:

154 some dengue patients die, and dengue outbreaks arise in some places. This category

155 illustrates that fatalities happened and, in some areas, declared a dengue outbreak.

156 *"Dengue fever case in Asmat Regency has risen dramatically in the past month; the*
157 *Asmat Regency Government has determined an outbreak of dengue fever."*

158
159 *"DBD cases in the Yogyakarta City soared as long as two patients died"*

160
161 *"Many cases of dengue in Solo, some of them die."*

162
163

164 During COVID-19, people said they felt anxiety about dengue because of the pain and

165 trauma of experiencing dengue in the past. So, they were afraid of getting infected again;

166 even when they felt dengue symptoms, they were worried.

167 *"In the next few days, hopefully, it won't be fever anymore because if I still have a fever, I*
168 *have to go for the blood test. I'm afraid of getting dengue for the second time."*

169
170 *"On Monday last week, I was shocked because of a fever; I was afraid of dengue. But*
171 *after checking in the hospital, thank God I'm fine."*

172
173 *"Friends, if you have a brother or nephew who has a fever and red spots appear on the*
174 *skin and tongue, please run to the hospital immediately."*

175
176

177 In addition, people expressed their afraid of the pain and symptoms of dengue. They also

178 spoke about concerns or fears with the presence of mosquitoes. However, they did not

179 specifically mention *Aedes aegypti*.

180 *"Many mosquitoes make me sick with dengue; I'm suspicious about getting dengue*
181 *again."*
182
183 *"In the first month of class, I got dengue because there were a lot of mosquitoes in my*
184 *class."*
185
186 *"Because I got dengue some time ago, I'm terrified of mosquitoes, afraid to open the*
187 *window, and I always put mosquito repellents."*
188

189 The last category is that dengue prevention is still being carried out during COVID-19,
190 either educating the public or carrying out actual activities such as fogging.

191 *"In order to prevent the spread of dengue fever, mass fogging activities are carried out in*
192 *the Singgi environment of the Gulling House."*
193
194 *"The Papua Provincial Health Office (Dinkes) is intensifying counseling on preventing the*
195 *transmission of dengue fever."*
196
197 *"An integrated team from Petojo Selatan village, Gambir sub-district, Central Jakarta,*
198 *held an eradication of mosquito nests (PSN)."*
199

200 **3. Gap Identified and Interview**

201 From two processes of data collection, namely policy review and social listening via Twitter,
202 several problems in dengue control during the COVID-19 pandemic; namely, dengue still
203 occurs in the community during COVID-19. This result was confirmed by an interview
204 informant, a dengue program implementer at the primary health centers, who stated that
205 dengue persisted during COVID-19.

206 *(During COVID-19) Dengue still occurs even though they have decreased compared to*
207 *2019. In our PHC, they were 62, 48, and 12 cases for 2019, 2020, and 2021*
208 *respectively." (Female, PHC dengue officer)*
209

210 Although the government has issued regulations to prevent dengue during the pandemic,
211 it is not running optimally in society. It was confirmed from the interview with a dengue
212 officer at a primary health center.

213 *"(During the pandemic) eradication of mosquito nests (PSN) runs by prioritizing social*
214 *distancing, but superficially...because Jumantik coordinator only monitors containers*
215 *outside the house, containers inside the house were asked to the owner. For reporting*
216 *per house (one house one Jumantik) by homeowners, some reporting some not – usually*
217 *they reported using WA" (Female, PHC dengue officer)*
218

219 Even though the eradication of mosquito nests is trying to be carried out during the
220 pandemic, still, the impact does not have a maximal effect on policy because the manual
221 reporting system cannot run normally. As a result, the data that is the basis for evidence-
222 based policymaking is not well provided. Dengue officers confirmed this at the PHC and
223 the provincial health office.

224 *"The larva inspection report was working (during the pandemic); the larva free number*
225 *was also calculated but cannot be used as a reference because it does not represent the*
226 *situation on the field" (Female, PHC dengue officer).*

227
228 *"Reporting of larva inspection does not stop during the pandemic, but the quantity was*
229 *decreased. So, larva free rate (ABJ) cannot be calculated" (Male, Provincial dengue*
230 *officer)*
231

232 Discussion

233 Dengue, which is still globally exacerbated by the spread of COVID-19 that has implications
234 for social restrictions, has become a severe problem in Indonesia's routine dengue vector control
235 programs. During the COVID-19 pandemic, the government enforced vector control by
236 emphasizing social distancing. However, this doesn't seem to be running well either. Seeing this
237 situation, the gap for improvement during COVID-19 in dengue vector control in Indonesia remains
238 unclear. Identifying the dengue situation and the vector control works during a pandemic will
239 facilitate the development of the innovation and may improve responses to currently available
240 interventions.

241 We want to know the gap for improvement between expectation and reality in dengue
242 vector control during the pandemic seen by the government and society. Through a combination of
243 policy review and social listening that triangulate with an interview, we identified that the Indonesian
244 government had issued a regulation on vector control during the pandemic. However, dengue
245 cases still occur in some locations, and even in some locations, outbreaks were declared. Vector
246 control does not run optimally due to social restrictions, so larva inspection reports cannot be used
247 as a reference in decision-making.

248 The dengue case during the pandemic still existed, although it tends to decrease in
249 quantity, this was confirmed by social listening via Twitter and approved by the dengue officer. This
250 result follows another study in Asia, India, Latin America, and Malaysia, which stated that dengue
251 cases during the COVID-19 pandemic decreased, presumably due to limited human movement.
252 Hence, the hosts stayed home, so they did not infect others^{6,7,15}. On the other hand, this decline in
253 cases should also be suspected to the public's reluctance to visit health facilities due to fear of
254 contracting COVID-19¹⁶. So it could be that the case looks slightly reduced because of the many
255 underreported cases⁶. However, different conditions were reported by several regions of Indonesia,
256 which stated there was an increase in dengue cases at the beginning of the COVID-19 pandemic,
257 including in Bali and East Java^{17,18}.

258 Regarding mosquitoes, this study shows people's complaints about the presence of
259 mosquitoes during COVID-19. People even said there were lots of mosquitoes around them and
260 even felt afraid because they had been infected with dengue. Several studies reported that the
261 COVID-19 pandemic, coupled with social restrictions, caused the increase in mosquito
262 densities^{19,20} due to the stop of dengue vector control movement. This means that the risk of
263 humans being bitten by mosquitoes also increases²¹. Accordingly, the mosquito population was
264 difficult to control then the population was increasing.

265 The complaint about the number of mosquitoes was related to the vector control
266 empowerment program not running effortlessly during the COVID-19 pandemic due to social
267 restrictions, as stated by previous research²². Social restriction policy also impacts disease control
268 policies and dengue vectors that rely on larvae inspection data that require entry into the house.
269 Since 2015 the Indonesian government has launched vector control through household-based
270 community empowerment (one house, one jumantik). Still, not all regions have implemented this
271 program – some are entering the socialization phase but have not yet implemented it. In regions
272 that have implemented one house-one jumantik, the data flow from households during the COVID-
273 19 pandemic was not correctly reported, so it is clear that the data supply for policies is disrupted.
274 Therefore, seeing the importance of vector control and the one house one jumantik program as an
275 effective community empowerment model, it is necessary to support an independent reporting

276 system at the household level. Thus, the flow of larva inspection data does not rely on manual
277 report form as has been done so far. This is undoubtedly a momentum to support vector control
278 programs during a pandemic or even after the pandemic as mitigation of similar conditions in the
279 future.

280 **Conclusion**

281 COVID-19 implies the dengue case and vector control. The society reported that Dengue disease
282 remain occurred during the pandemic. They also stated the existence of mosquitoes around them.
283 The social restriction is associated with disrupting routine vector control that runs inspection by
284 entering the house. This situation impacted the data supply for a policy generally referring to
285 societal larvae monitoring. We recommend developing one house one jumantik reporting system
286 as room for improvement of vector control in adaptation to COVID-19 and social restriction.

287 **Acknowledgments**

288 This study has received funding from the Ministry of Education and Culture, the Republic of
289 Indonesia, with grant number 030/PB.PDUPT/BRIn.LPPM/VI/2022. We thank Mrs. Arkana and Mr.
290 Regha from the health office of Yogyakarta for their helpful discussion during the research.

291 **Disclosure**

292 The author reports no conflicts of interest in this work.

293 **References**

- 294 1. WHO. Dengue and severe dengue [Internet]. Web. 2022 [cited 2022 Aug 22]. Available
295 from: <https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue>
- 296 2. WHO. Dengue and severe dengue [Internet]. Web. 2022 [cited 2022 Aug 14]. Available
297 from: <https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue>
- 298 3. Harapan H, Ryan M, Yohan B, Abidin RS, Nainu F, Rakib A, et al. Covid-19 and dengue:

- 299 Double punches for dengue-endemic countries in Asia. *Rev Med Virol.* 2021;31(2):1–9.
- 300 4. Khan S, Akbar SMF, Yahiro T, Mahtab M Al, Kimitsuki K, Hashimoto T, et al. Dengue
301 Infections during COVID-19 Period: Reflection of Reality or Elusive Data Due to Effect of
302 Pandemic. *Int J Environ Res Public Health.* 2022;19(17).
- 303 5. Wiyono L, Rocha ICN, Cedeno TDD, Miranda AV, Prisno DEL. Dengue and COVID-19
304 infections in the ASEAN region: A concurrent outbreak of viral diseases. *Epidemiol Health.*
305 2021;43:1–5.
- 306 6. Chen Y, Li N, Lourenço J, Wang L, Cazelles B, Dong L, et al. Measuring the effects of
307 COVID-19-related disruption on dengue transmission in Southeast Asia and Latin
308 America: a statistical modelling study. *Lancet Infect Dis.* 2022 May 1;22(5):657–67.
- 309 7. Ong SQ, Ahmad H, Ngesom AMM. Implications of the COVID-19 lockdown on Dengue
310 transmission in Malaysia. *Infect Dis Rep [Internet].* 2021 Feb 1 [cited 2022 Aug
311 22];13(1):148. Available from: [/pmc/articles/PMC7985789/](https://pubmed.ncbi.nlm.nih.gov/34811111/)
- 312 8. WHO. The Republic of Indonesia Health System Review [Internet]. Vol. 7, World Health
313 Organization. 2017. 64–105 p. Available from:
314 <http://apps.who.int/iris/bitstream/10665/254716/1/9789290225164-eng.pdf>
- 315 9. Sulistyawati S. Dengue Prevention and Control in Indonesia: A case study in Yogyakarta
316 City. Umeå University. Umeå University, Sweden; 2022.
- 317 10. Sulistyawati S, Astuti FD, Umiyati SR, Satoto TBT, Lazuardi L, Nilsson M, et al. Dengue
318 vector control through community empowerment: lessons learned from a community-
319 based study in Yogyakarta, Indonesia. *Int J Environ Res Public Health.* 2019;16:1013.
- 320 11. WHO. A review of entomological sampling methods and indicators for dengue vectors
321 [Internet]. Web. 2024 [cited 2022 Aug 23]. Available from:
322 <https://apps.who.int/iris/handle/10665/68575>
- 323 12. Li Y, Zhou G, Zhong S, Wang X, Zhong D, Hemming-Schroeder E, et al. Spatial
324 heterogeneity and temporal dynamics of mosquito population density and community
325 structure in Hainan Island, China. *Parasites and Vectors [Internet].* 2020 Sep 4 [cited 2022
326 Aug 23];13(1):1–11. Available from:

- 327 <https://parasitesandvectors.biomedcentral.com/articles/10.1186/s13071-020-04326-5>
- 328 13. Sulistyawati S, Mulasari SA, Sukei TW. Understanding community involvement on
329 Dengue prevention in Sleman, Indonesia: A free listing approach. *J UOEH*.
330 2020;42(3):231–6.
- 331 14. The Ministry of Health of Indonesia. About the Implementation of Dengue Prevention and
332 Control in the Covid-19 Pandemic Situation (Tentang Pelaksanaan Pencegahan dan
333 Pengendalian DBD dalam Situasi Pandemi Covid-19). Jakarta: Ministry of Health of
334 Republic Indonesia; 2020. p. 1–2.
- 335 15. Sharma H, Ilyas A, Chowdhury A, Poddar NK, Chaudhary AA, Abdul S, et al. Does COVID
336 - 19 lockdowns have impacted on global dengue burden ? A special focus to India. *BMC*
337 *Public Health* [Internet]. 2022;1–23. Available from: [https://doi.org/10.1186/s12889-022-](https://doi.org/10.1186/s12889-022-13720-w)
338 [13720-w](https://doi.org/10.1186/s12889-022-13720-w)
- 339 16. Mashudi DN, Ahmad N, Said SM. Level of dengue preventive practices and associated
340 factors in a Malaysian residential area during the COVID-19 pandemic: A cross-sectional
341 study. *PLoS One* [Internet]. 2022;17(4 April):1–15. Available from:
342 <http://dx.doi.org/10.1371/journal.pone.0267899>
- 343 17. Adnyana IMDM, Azhari FSS, Sudaryati NLG. Prevalence of Dengue Hemorrhagic Fever in
344 Bali from 2015 to 2020 and during the Covid-19 pandemic. *J Berk Epidemiol*.
345 2022;10(2):169–78.
- 346 18. Trisandy AY, Azmi Maruf M, Yudhastuti R, Lusno MFD, Notobroto HB. Large-scale social
347 restriction (LSSR) policy and dengue hemorrhagic fever cases during the Covid-19
348 pandemic in Indonesia: A case study of five subregions of East Java province. *Kesmas*.
349 2021;16(1):49–52.
- 350 19. Daniel Reegan A, Rajiv Gandhi M, Cruz Asharaja A, Devi C, Shanthakumar SP. COVID-
351 19 lockdown: impact assessment on Aedes larval indices, breeding habitats, effects on
352 vector control programme and prevention of dengue outbreaks. *Heliyon* [Internet].
353 2020;6(10):e05181. Available from: <https://doi.org/10.1016/j.heliyon.2020.e05181>
- 354 20. Lu X, Bambrick H, Pongsumpun P, Dhewantara PW, Toan DTT, Hu W. Dengue outbreaks

355 in the covid-19 era: Alarm raised for Asia. PLoS Negl Trop Dis [Internet]. 2021;15(10):6–
356 11. Available from: <http://dx.doi.org/10.1371/journal.pntd.0009778>

357 21. Rahim MH, Dom NC, Ismail SNS, Mulud ZA, Abdullah S, Pradhan B. The impact of novel
358 coronavirus (2019-nCoV) pandemic movement control order (MCO) on dengue cases in
359 Peninsular Malaysia. One Heal [Internet]. 2021;12(October 2020):100222. Available from:
360 <https://doi.org/10.1016/j.onehlt.2021.100222>

361 22. Cavany SM, España G, Vazquez-Prokopec GM, Scott TW, Alex Perkins T. Pandemic-
362 associated mobility restrictions could cause increases in dengue virus transmission. PLoS
363 Negl Trop Dis. 2021;15(8):1–19.

364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382

383 **Figure**

384 Figure 1. Vector control and policy development framework

385 Figure 2. The developed framework used during the research

386 Figure 3. The journey of dengue vector control in Indonesia

387

388

Dove Medical Press: Submission accepted for publication2 messages

Ms Sandi McIver <sandi@dovepress.com>
Reply-To: Ms Sandi McIver <sandi@dovepress.com>
To: Dr Sulistyawati <sulistyawati.suyanto@ikm.uad.ac.id>

Mon, Jan 16, 2023 at 4:11 AM

Dear Dr Sulistyawati,

I am pleased to inform you that the submission, "Rapid appraisals of the transformation strategy required to sustain Dengue vector control during and after the COVID-19 pandemic in Indonesia", has been accepted for publication in "Risk Management and Healthcare Policy". The article publishing charge is now payable before the paper can be progressed any further and an invoice is accessible here: https://www.dovepress.com/invoice.php?i_key=EfsUlsK2mxvpWzIyPJzxJl63846

(If you require any amendments to your invoice please reply to this email. Please note invoices cannot be amended once a payment has been made)

The above acceptance for publication is conditional upon the required copyright permissions being obtained, if applicable.

The fee can be paid by credit card (Visa, MasterCard or AMEX) or bank transfer*. Instructions are given below, which we strongly recommend you read before organizing payment.

Paying by credit card:

Click on the URL given above to be taken to our secure credit card payment gateway. Because credit card payments are immediate, we recommend using this method to ensure that processing of your paper continues promptly. When processing your payment through the secure credit card system you will need to remain on the payment pages until the transaction has completed – either successful or failed. Do not close your browser during this time.

Paying by bank transfer:

Please forward the invoice accessible through the URL given above together with this information to your organization's accounts administrator:

Bank transfer details:

BNP Paribas London
10 Harewood Avenue, London, NW1 6AA

Account name: Dove Medical Press Ltd
Account No.: 87810020 (This account is for USD transactions only)
Sort code: 40-63-84
VAT No.: GB 365 462 636
IBAN: GB70BNPA40638487810020
SWIFT BIC: BNPAGB22
CORRESPONDENT: BNPAUS3N (Intermediary Bank)

IMPORTANT NOTES WHEN PAYING BY BANK TRANSFER:

* Bank transfer costs: If paying by bank transfer you must ensure that the full amount of the invoice is transferred to Dove Medical Press. Any bank fees should be at the senders expense as under-payment of your invoice will result in delays to your paper being published.

- Please instruct your accounts administrator to include your submission ID in the payment information provided when the transfer is initiated.

PLEASE NOTE: We do not accept payment by check.

Receipts:

If you require a receipt please let me know.

The acceptance of your paper is subject to all outstanding content-related queries being addressed to the satisfaction of the Publisher.

If you have any questions about your paper please contact us at any time, we welcome your feedback.

Yours sincerely

Ms Sandi Mclver
Dove Medical Press
www.dovepress.com - open access to scientific and medical research
Dove Medical Press is part of Taylor & Francis Group, the Academic Publishing Division of Informa PLC
391933

Note: By having your paper accepted for publication you agree to our terms of publication which, amongst other things, require that:

- 1) Your paper should be unique and not published elsewhere. If you have reused or adapted figures, tables or sections of text from papers published elsewhere you must approach the copyright owner (normally the journal publisher and not the author) and obtain their permission to re-use those elements;
- 2) Your paper should not be under consideration by any other journal or publisher; and
- 3) You should advise us immediately if you have received any financial or other support from a commercial organisation in the preparation of this manuscript; and
- 4) The Editor-in-Chief or their Associate Editor may, at their sole discretion, cancel the acceptance of any paper. In the event of a refund of the article publishing charge Dove Medical Press will retain EUR278, GBP230 or US\$300 to cover transaction and processing costs.

sulistyawati suyanto <sulistyawati.suyanto@ikm.uad.ac.id>
To: Ms Sandi Mclver <sandi@dovepress.com>

Tue, Jan 17, 2023 at 9:22 AM

Dear Ms. Sandi Mclver,

With this email, I am sending the bank transfer receipt of APC to my article.

Best regards,

Sulistyawati, MPH., Ph.D.

Department of Public Health, Universitas Ahmad Dahlan, Indonesia

+62-8170402693 | sulistyawati.suyanto@ikm.uad.ac.id

<https://www.scopus.com/authid/detail.uri?authorId=55956961800>

<https://www.researchgate.net/profile/Sulistyawati-Sulistyawati>

<https://orcid.org/0000-0002-7299-0360>

[Quoted text hidden]

 **Bank Transfer Receipt.pdf**
18737K

Your corrected files have been successfully submitted [ID: 391933]

1 message

Oliver Spence <Oliverspence@dovepress.com>
Reply-To: Oliver Spence <Oliverspence@dovepress.com>
To: Dr Sulistyawati <sulistyawati.suyanto@ikm.uad.ac.id>

Mon, Jan 9, 2023 at 7:25 AM

Dear Dr Sulistyawati,

Thank you for submitting your corrected revised manuscript and additional files. These have been uploaded successfully. We will continue processing the submission in the next few days, and will be in contact with an update once we have finished our remaining Editorial Checks.

We have received the following files:

- 09_Jan_2023_391933_Revised_Manuscript_for_corrections_-_v3_SS.docx
- Figure-3.jpg
- Figure-2.jpg
- Figure-1.jpg

If you have any queries, or if there is a problem with any of the uploaded files, please contact us and we can help get it corrected.

Regards,
Oliver Spence
Revised Manuscript Co-ordinator
Oliverspence@dovepress.com
Dove Medical Press Ltd
Dove Medical Press is part of Taylor & Francis Group, the Academic Publishing Division of Informa PLC
(ID 391933)

**ACTION REQUIRED Risk Management and Healthcare Policy - Your author proofs
[ID 391933]**

1 message

Boon Lee <boonlee@dovepress.com>
Reply-To: Boon Lee <boonlee@dovepress.com>
To: Dr Sulistyawati <sulistyawati.suyanto@ikm.uad.ac.id>

Fri, Jan 20, 2023 at 4:26 AM

Dear Dr Sulistyawati

The author proofs for your paper "Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia" [ID 391933] are now available by clicking this link:
<https://iauthor.integra.co.in/editor?docid=C6D5B513>

Please make your corrections in the online correction tool and ensure you complete the process by using the blue Submit button in the top right-hand corner, then select New Proof to send your corrections through, or Approve if there are no changes to be made to your paper.
Ensure you show your co-authors the PDF proofs which can be downloaded from the link above and use the online correction tool to mark any final corrections on their behalf.

Please submit your proof within the next 5 working days (due 27 Jan 2023) to ensure your paper is published in a timely manner.

Do contact me if you have any questions:

Live Support https://www.dovepress.com/live_help.t

Email: boonlee@dovepress.com

Phone: +64-9-443 3060

Kind regards

Boon Lee

Risk Management and Healthcare Policy

Dove Medical Press

Dove Medical Press is part of Taylor & Francis Group, the Academic Publishing Division of Informa PLC

www.dovepress.com - open access to scientific and medical research

Instruction

Welcome to Dove Medical Press online Correction tool.

Proof Cover Sheet

Journal : Risk Management and Healthcare Policy

Author(s) : Sulistyawati Sulistyawati, Herman Yuliansyah, Tri Wahyuni Sukesi, Arfiani Nur Khusna, Surahma Asti Mulasari, Fatwa Tentama, Bambang Sudarsono, Fanani Arief Ghozali.

Article Title : Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia

Submission No : 391933

Paper citation : Sulistyawati S, Yuliansyah H, Sukesi TW, Nur Khusna A, Mulasari SA, Tentama F, Sudarsono B, Arief Ghozali F. Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia. Risk Management and Healthcare Policy. In Press 2023.

Dear Dr Sulistyawati,

1. Please check these proofs carefully. It is the responsibility of the contact person to check these and approve or amend them as a second proof is not normally provided. This is your chance to highlight any errors or omissions in your paper before it is published.

Please limit changes at this stage to the correction of errors (we would not expect corrections to exceed 30 changes). You should not make minor changes, improve prose style, add new material, or delete existing material at this stage.

2. Please review the table of contributors below and confirm that the names are structured correctly and that the authors are listed in the correct order. This check is to ensure that all author names will appear correctly online and when the article is indexed.

Sequence	First name / given name	Family name / last name
1	Sulistyawati	Sulistyawati
2	Herman	Yuliansyah
3	Tri Wahyuni	Sukesi
4	Arfiani	Nur Khusna
5	Surahma Asti	Mulasari
6	Fatwa	Tentama
7	Bambang	Sudarsono
8	Fanani	Arief Ghozali

PubMed Citation : Sulistyawati S, Yuliansyah H, Sukesi TW, Nur Khusna A, Mulasari SA, Tentama F, Sudarsono B, Arief Ghozali F

Google Citation : Sulistyawati Sulistyawati, Herman Yuliansyah, Tri Wahyuni Sukesi, Arfiani Nur Khusna

[View PDF](#)
[Start Proofing](#)

PROOF COVER SHEET

Journal: *Risk Management and Healthcare Policy*
Author(s): Sulistyawati Sulistyawati, Herman Yuliansyah, Tri Wahyuni Sukei, Arfiani Nur Khusna, Surahma Asti Mulasari, Fatwa Tentama, Bambang Sudarsono and Fanani Arief Ghozali
Article title: Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia
Submission no: 391933
Paper citation: Sulistyawati S, Yuliansyah H, Sukei TW, Nur Khusna A, Mulasari SA, Tentama F, Sudarsono B, Arief Ghozali F. Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia. *Risk Management and Healthcare Policy*. In Press 2023

Dear Dr Sulistyawati,

1. Please check these proofs carefully. It is the responsibility of the contact person to check these and approve or amend them as a second proof is not normally provided. This is your chance to highlight any errors or omissions in your paper before it is published.

Please limit changes at this stage to the correction of errors (we would not expect corrections to exceed 30 changes). You should not make minor changes, improve prose style, add new material, or delete existing material at this stage.

2. Please review the table of contributors below and confirm that the names are structured correctly and that the authors are listed in the correct order. This check is to ensure that all author names will appear correctly online and when the article is indexed.

Sequence	First name/given name	Family name/last name
1.	Sulistyawati	Sulistyawati
2.	Herman	Yuliansyah
3.	Tri Wahyuni	Sukei
4.	Arfiani	Nur Khusna
5.	Surahma Asti	Mulasari
6.	Fatwa	Tentama
7.	Bambang	Sudarsono
8.	Fanani	Arief Ghozali

PubMed Citation: Sulistyawati S, Yuliansyah H, Sukei TW, Nur Khusna A, Mulasari SA, Tentama F, Sudarsono B, Arief Ghozali F

Google Citation: Sulistyawati Sulistyawati, Herman Yuliansyah, Tri Wahyuni Sukei, Arfiani Nur Khusna, Surahma Asti Mulasari, Fatwa Tentama, Bambang Sudarsono, Fanani Arief Ghozali

To change your PubMed or Google Citation please update your details with a comment in the correction tool.

AUTHOR QUERIES

Please complete the following steps:

1. Read your entire proof and respond to all the Author Queries (AQs) and make necessary amendments directly in the text (avoid leaving instructions/comments unless essential). All AQs must be answered before you submit the corrections to your proof.
2. Please ensure your corrections (if any) are kept to a minimum.
3. Please submit corrections when you are sure you have answered all of the AQs, and have proofread the entire article (including figures and tables).

AQ1 Dear author, please check your paper carefully for any errors that may have been introduced during typesetting of your manuscript.

AQ2 **REDUCE TIME TO PUBLICATION**
Dear author, before you send corrections back, please download the PDF proof (see “Download or view PDF” on top right hand side of correction tool), check with each of the authors that all corrections will be submitted. Please pay special attention to authors names and affiliations, funding/acknowledgments, and table and figure presentation on the PDF proof.

AQ3 Dear author, please clarify whether the edits to the correspondence are appropriate.

AQ4 Dear author, your figures/tables may have been redrawn/edited to align with PubMed specifications and journal house style, please check each one carefully.

AQ5 Dear author, we notice that you have used color coding (or shading) in your table. We are unable to show the color in our online correction tool, however it is showing in your pdf proof and will show on your published paper.

AQ6 Dear author, please note that CrossRef and PubMed databases have been used to validate the references and mismatches have been updated in the manuscript. Please check carefully and confirm these have been done correctly.

AQ7 Dear author, since Reference [2] was a duplicate of Reference [1], Reference [2] has been deleted and all subsequent references in the reference list and their corresponding citations have been renumbered accordingly. Please check and confirm that this was correctly done.

Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia

AQ2 AQ1

Sulistiyawati Sulistiyawati¹, Herman Yuliansyah², Tri Wahyuni Sukei¹, Arfiani Nur Khusna², Surahma Asti Mulasari¹, Fatwa Tentama³, Bambang Sudarsono⁴, Fanani Arief Ghozali⁵

5

¹Faculty of Public Health, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; ²Department of Informatics, Faculty of Industrial Technology, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; ³Faculty of Psychology, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; ⁴Department of Automotive Technology Vocational Education, Faculty of Teacher Training and Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; ⁵Department of Electronics Engineering Vocational Education, Faculty of Teacher Training and Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia

10

Correspondence: Sulistiyawati Sulistiyawati, Faculty of Public Health, Universitas Ahmad Dahlan, Kampus 3, Jln Prof. Dr. Soepomo, Janturan, Umbulharjo, Yogyakarta, Indonesia, Tel +6281 7040 2693, Email sulistiyawati.suyanto@ikm.uad.ac.id

AQ3

Purpose: This research aimed to observe the gap for improvement in dengue vector control during COVID-19, considering two stakeholders: the government and society. We formulated two research questions: 1) How is the government managing dengue vector control during the COVID-19 pandemic? 2) What is the situation of dengue disease, its vectors, and vector control in the community?

Methods: This study uses multiple approaches: policy review, social listening using Twitter analysis, and interviews. A policy review was employed to capture the journey of dengue vector control in Indonesia from dengue found in Indonesia until the COVID-19 pandemic. Twitter data captured public opinions through social media about dengue and vector control. Interviews involved program implementers that consider knowing the situation in the field of dengue and its vector control. The informant was selected through purposive sampling.

15

Results: To control dengue disease, the Indonesian government has released regulations about dengue vector control that adjusts the COVID-19 situation, but vector control is still not running optimally, resulting in the data supply for policy not running well.

20

Conclusion: Dengue cases continued during the COVID-19 pandemic, even in some places stated an outbreak occurred. Vector control does not work correctly during the COVID-19 pandemic due to social restrictions. It is recommended to encourage the implementation of community empowerment through one house, one jumantik, which is equipped with self-reporting to mitigate and respond to similar situations as the pandemic.

25

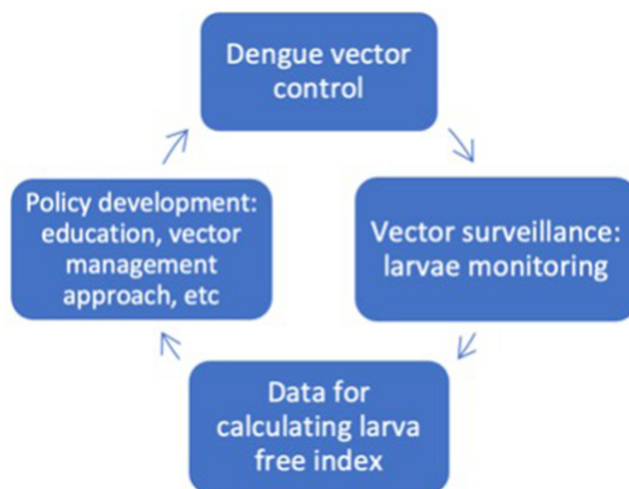
Keywords: dengue, COVID-19, vector control, policy, pandemic

Introduction

Dengue is a vector-borne disease caused by the dengue virus carried by the *Aedes aegypti* mosquito.¹ This disease is still a big problem in tropical countries, including Indonesia, which is known to be endemic to this disease. WHO stated that in 2020 – the year that COVID-19 began to spread – several countries, including Indonesia, reported an increase in dengue cases.¹ This indicates that with the emergence of COVID-19, a new challenge in handling dengue disease can even be said to be a double burden for countries that have previously struggled to eradicate dengue.² Several studies indicate that during COVID-19, one of which stated that the number of dengue cases decreased by approximately 16% during the COVID-19 pandemic.³ Reports from some ASEAN countries in 2020 followed a similar pattern: the number of dengue cases in 2020 was lower than in 2019. One of them is Indonesia, where cases were twice as high in 2019 as the previous year (137,760), while it was reported to have decreased in 2020 (95,893).⁴ Furthermore, this needs to be investigated further whether it is due to the lockdown effect so that there is no interaction with positive hosts or underreporting cases^{5,6} or because of people reluctant to health seeking.

30

35



AQ4 **Figure 1** Vector control and policy development framework.

Referring to the existing health system in Indonesia, the Indonesian government adopted a decentralized system. In this context, health programs, including dengue control, are broadly designed by the center and then carried out at lower levels to be adjusted to the context of the region, including in the budget allocation.⁷ If we look further, the dengue program in Indonesia is carried out by two main stakeholders, namely the government as a regulator and the community as both the subject and object of the dengue program.⁸ The government and its staff's domain is to create appropriate programs based on data and implement them with the community.

Indonesia takes vector control through community empowerment in vector monitoring because this program is considered more efficient and offers sustainability.⁹ Vector monitoring is a vital part of vector surveillance which becomes evidence-based for determining the distribution, density, and larval habitats.^{10,11} In Indonesia, vector surveillance is conducted through the Jumantik program, a squad monitoring the existence of larvae by entering the house in the society.^{9,12} Jumantik cadre collects and reports the data in the field periodically to the village, which is forwarded to the health center to calculate the larva indices, including house index, breteau index, and container index, which are considerations in making vector control policies. The role of vector monitoring activity in policy development is presented in Figure 1.

So far, the Jumantik program as vector surveillance has been running well. Nevertheless, problems arise when COVID-19 blows, and the government implements social and physical distancing to limit interaction to avoid COVID-19 transmission. The social restriction impacts the absence of door-to-door larva inspection by the Jumantik cadre. On the other hand, this data is an essential source for determining dengue prevention measures in the community. Based on all backgrounds, we observed the gap for improvement in dengue vector control during COVID-19 from 2 stakeholders, namely the government and society (Figure 2). We formulated two research questions: 1) How is the government managing dengue vector control during the COVID-19 pandemic? 2) What is the situation of dengue disease, its vectors, and vector control in the community?

Materials and Methods

Study Design

This study uses multiple approaches: policy review, social listening using Twitter analysis, and interviews. A policy review was employed to capture the journey of dengue vector control in Indonesia. Twitter data figured out the public opinions about dengue and vector control. Interviews involved dengue program implementers that were selected through purposive sampling. The informant in this study was the person in charge of the dengue program at the primary health center and health office, who was responsible for vector control in society and bridged communication to the health office related to proper dengue intervention in a particular area.



Figure 2 The developed framework used during the research.

Data Source, Data Collection, Sample, and Analysis

The data collection process is summarized in [Table 1](#). We did this research through multiple approaches: policy review, social listening via Twitter, and interview. 70

Ethical Consideration

The ethical approval was given by Universitas Ahmad Dahlan Ethical Board (#012205052). Inform consent was obtained before the interview started. The informant was informed that all analyses performed would be anonymized for publication purposes. 75

AQ5 Table 1 Data Source, Method of Data Collection, Sample, and Analysis

Domain	Data Source	Method of Data Collection	Sample	Method of Data Analysis
Government - regulator	Policy review	Modification of previous research and addition with dengue vector control in the COVID-19 era	Several policies included since 1968	Document reviews
Society	Social Listening via Twitter	Crawling tweets used Python programming with the Twitter API Key and the keyword “demam berdarah.”	A total of 7419 Tweets were extracted with the time frame of Tweets 22/7/2022-7/8/2022	Data were analyzed using a qualitative approach with thematic analysis to develop a theme.
Program implementer	Interview	Interview using semi-structured interview through face-to-face interview with a purposive sampling among the dengue program implementer	Two dengue program implementers in PHC and health office	Field notes were generated and analyzed using thematic analysis.

Results

Policy Review

These policy reviews were conducted to draw the journey of dengue prevention in Indonesia. This review was a development from previous research conducted by Sulistiyawati (2020),⁸ which was added to the latest policy by the Indonesian government in controlling dengue vectors during the COVID-19 pandemic¹³ (Figure 3). 80

To control dengue, Indonesia has chosen to control the dengue vector in several ways: chemistry, physics, and biology. However, since 1992, chemical control has been gradually reduced and focused on vector control through the movement of cleaning mosquito nests. In 2015 (5 years before the pandemic), the government released the one house one jumantik program, which actively involved the community responsible for cleaning larvae in mosquito breeding sites at their home. Once COVID-19 exploded, the government issued a regulation to adapt to the situation; subsequently, the one house-one Jumantik program was forced with social distancing. 85

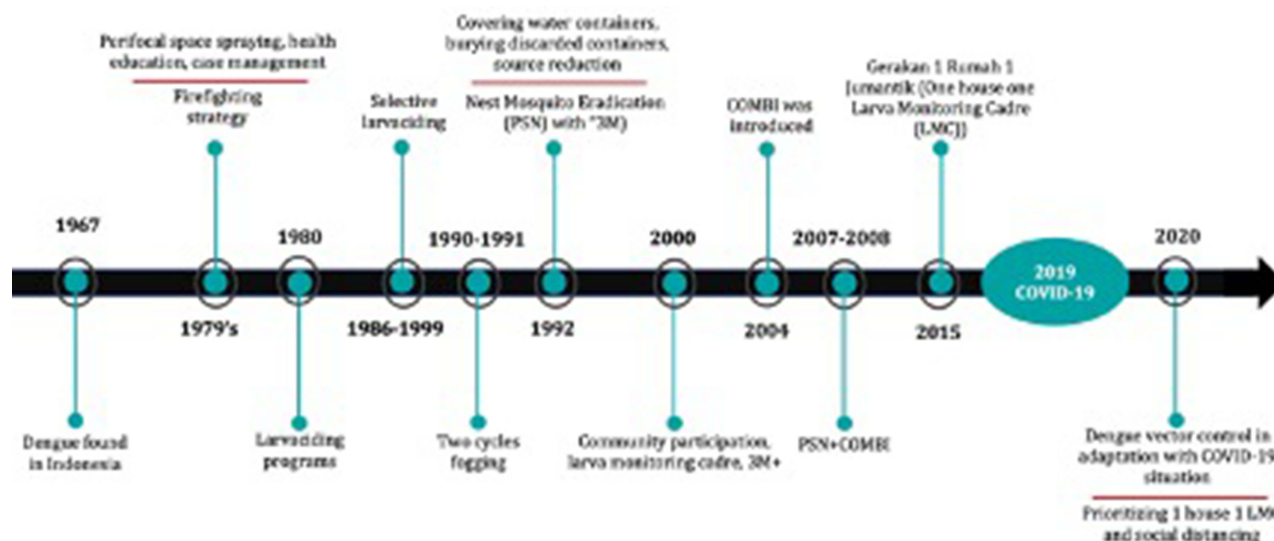


Figure 3 The journey of dengue vector control in Indonesia.

Social Listening Analysis from Twitter

A total of 7419 yields from Twitter. After screening duplicates, we got 2411 tweets included in the analysis. Table 2 summarizes our social listening analysis conducted through Twitter data showing that dengue is still a big problem during the COVID-19 pandemic. 90

Many people provide awareness of dengue because cases in their area are increasing with some types of statements, such as being in dengue season and dengue increase because of overcrowding of population density.

Dengue Cases in Bengawan City Increased Sharply in the Middle of This Year.

The population density in South Jakarta and the shady temperature are the reasons for dengue cases rising (in this location).

Looks like now the dengue season again; my friend is also hospitalized because of dengue; I hope he gets well soon. 95

Dengue Case Increasing, Bekasi City Government Asks the Public to Be Aware.

The category of illness found in society is an abstraction to articulate that dengue incidents still occurred during COVID-19. This was captured from the survivor's Tweet and those who told us the situation around him.

I went to Bandung when I wasn't feeling well and ended up with dengue yesterday.

From these symptoms, it's clear I was attacked by dengue; I hope I'm not hospitalized. 100

Yesterday, on Eid al-Adha, I brought my sister to be treated for dengue.

Next is the category mortality and outbreak occurred, which comes from two subcategories: some dengue patients die, and dengue outbreaks arise in some places. This category illustrates that fatalities happened and, in some areas, declared a dengue outbreak.

Dengue fever case in Asmat Regency has risen dramatically in the past month; the Asmat Regency Government has determined an outbreak of dengue fever. 105

DBD cases in the Yogyakarta City soared as long as two patients died

Many cases of dengue in Solo, some of them die.

During COVID-19, people said they felt anxiety about dengue because of the pain and trauma of experiencing dengue in the past. So, they were afraid of getting infected again; even when they felt dengue symptoms, they were worried. 110

Table 2 Twitter Data Analysis Themes

Theme	Category	Sub-Category
Dengue still be a severe problem during COVID-19	Alertness to dengue	Warning about dengue cases increasing
	Illness found in society.	Suffering from dengue or informed there is positive dengue around them
	Mortality and outbreak occurred.	Dengue patient dies
		Dengue outbreaks occurred in some places.
	Anxiety to dengue	I am feeling pain or trauma because of having dengue in the past.
		Worried because I have the dengue symptoms
	Worries to dengue vector	State a lot of mosquitoes around them
Dengue prevention is still needed.	Doing dengue prevention	

In the next few days, hopefully, it won't be fever anymore because if I still have a fever, I have to go for the blood test. I'm afraid of getting dengue for the second time.

On Monday last week, I was shocked because of a fever; I was afraid of dengue. But after checking in the hospital, thank God I'm fine.

Friends, if you have a brother or nephew who has a fever and red spots appear on the skin and tongue, please run to the hospital immediately. 115

In addition, people expressed their afraid of the pain and symptoms of dengue. They also spoke about concerns or fears with the presence of mosquitoes. However, they did not specifically mention *Aedes aegypti*.

Many mosquitoes make me sick with dengue; I'm suspicious about getting dengue again.

In the first month of class, I got dengue because there were a lot of mosquitoes in my class. 120

Because I got dengue some time ago, I'm terrified of mosquitoes, afraid to open the window, and I always put mosquito repellents.

The last category is that dengue prevention is still being carried out during COVID-19, either educating the public or carrying out actual activities such as fogging.

In order to prevent the spread of dengue fever, mass fogging activities are carried out in the Singgi environment of the Gulling House. 125

The Papua Provincial Health Office (Dinkes) is intensifying counseling on preventing the transmission of dengue fever.

An integrated team from Petojo Selatan village, Gambir sub-district, Central Jakarta, held an eradication of mosquito nests (PSN).

Gap Identified and Interview 130

From two processes of data collection, namely policy review and social listening via Twitter, several problems in dengue control during the COVID-19 pandemic; namely, dengue still occurs in the community during COVID-19. This result was confirmed by an interview informant, a dengue program implementer at the primary health centers, who stated that dengue persisted during COVID-19.

(During COVID-19) Dengue still occurs even though they have decreased compared to 2019. In our PHC, they were 62, 48, and 12 cases for 2019, 2020, and 2021 respectively. (Female, PHC dengue officer) 135

Although the government has issued regulations to prevent dengue during the pandemic, it is not running optimally in society. It was confirmed from the interview with a dengue officer at a primary health center.

(During the pandemic) eradication of mosquito nests (PSN) runs by prioritizing social distancing, but superficially...because Jumantik coordinator only monitors containers outside the house, containers inside the house were asked to the owner. For reporting per house (one house one Jumantik) by homeowners, some reporting some not – usually they reported using WA (Female, PHC dengue officer) 140

Even though the eradication of mosquito nests is trying to be carried out during the pandemic, still, the impact does not have a maximal effect on policy because the manual reporting system cannot run normally. As a result, the data that is the basis for evidence-based policymaking is not well provided. Dengue officers confirmed this at the PHC and the provincial health office. 145

The larva inspection report was working (during the pandemic); the larva free number was also calculated but cannot be used as a reference because it does not represent the situation on the field. (Female, PHC dengue officer)

Reporting of larva inspection does not stop during the pandemic, but the quantity was decreased. So, larva free rate (ABJ) cannot be calculated (Male, Provincial dengue officer)

150

Discussion

Dengue, which is still globally exacerbated by the spread of COVID-19 that has implications for social restrictions, has become a severe problem in Indonesia's routine dengue vector control programs. During the COVID-19 pandemic, the government enforced vector control by emphasizing social distancing. However, this does not seem to be running well either. Seeing this situation, the gap for improvement during COVID-19 in dengue vector control in Indonesia remains unclear. Identifying the dengue situation and the vector control works during a pandemic will facilitate the development of the innovation and may improve responses to currently available interventions.

155

We want to know the gap for improvement between expectation and reality in dengue vector control during the pandemic seen by the government and society. Through a combination of policy review and social listening that triangulate with an interview, we identified that the Indonesian government had issued a regulation on vector control during the pandemic. However, dengue cases still occur in some locations, and even in some locations, outbreaks were declared. Vector control does not run optimally due to social restrictions, so larva inspection reports cannot be used as a reference in decision-making.

160

The dengue case during the pandemic still existed, although it tends to decrease in quantity, this was confirmed by social listening via Twitter and approved by the dengue officer. This result follows another study in Asia, India, Latin America, and Malaysia, which stated that dengue cases during the COVID-19 pandemic decreased, presumably due to limited human movement. Hence, the hosts stayed home, so they did not infect others.^{5,6,14} On the other hand, this decline in cases should also be suspected to the public's reluctance to visit health facilities due to fear of contracting COVID-19.¹⁵ So it could be that the case looks slightly reduced because of the many underreported cases.⁵ However, different conditions were reported by several regions of Indonesia, which stated there was an increase in dengue cases at the beginning of the COVID-19 pandemic, including in Bali and East Java.^{16,17}

165

170

Regarding mosquitoes, this study shows people's complaints about the presence of mosquitoes during COVID-19. People even said there were lots of mosquitoes around them and even felt afraid because they had been infected with dengue. Several studies reported that the COVID-19 pandemic, coupled with social restrictions, caused the increase in mosquito densities^{18,19} due to the stop of dengue vector control movement. This means that the risk of humans being bitten by mosquitoes also increases.²⁰ Accordingly, the mosquito population was difficult to control then the population was increasing.

175

The complaint about the number of mosquitoes was related to the vector control empowerment program not running effortlessly during the COVID-19 pandemic due to social restrictions, as stated by previous research.²¹ Social restriction policy also impacts disease control policies and dengue vectors that rely on larvae inspection data that require entry into the house. Since 2015 the Indonesian government has launched vector control through household-based community empowerment (one house, one jumantik). Still, not all regions have implemented this program – some are entering the socialization phase but have not yet implemented it. In regions that have implemented one house-one jumantik, the data flow from households during the COVID-19 pandemic was not correctly reported, so it is clear that the data supply for policies is disrupted. Therefore, seeing the importance of vector control and the one house one jumantik program as an effective community empowerment model, it is necessary to support an independent reporting system at the household level. Thus, the flow of larva inspection data does not rely on manual report form as has been done so far. This is undoubtedly a momentum to support vector control programs during a pandemic or even after the pandemic as mitigation of similar conditions in the future.

180

185

Conclusion

COVID-19 implies the dengue case and vector control. The society reported that Dengue disease remain occurred during the pandemic. They also stated the existence of mosquitoes around them. The social restriction is associated with disrupting routine vector control that runs inspection by entering the house. This situation impacted the data supply for a policy generally referring to societal larvae monitoring. We recommend developing one house one jumantik reporting system as room for improvement of vector control in adaptation to COVID-19 and social restriction.

190

Acknowledgments

This study has received funding from the Ministry of Education and Culture, the Republic of Indonesia, with grant number 030/PB.PDUPT/BRIn.LPPM/VI/2022. We thank Mrs. Arkana and Mr. Regha from the health office of Yogyakarta for their helpful discussion during the research.

Disclosure

The authors report no conflicts of interest in this work.

References

1. World Health Organization. Dengue and severe dengue; 2022. Available from: <https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue>. Accessed January 18, 2023.
2. Harapan H, Ryan M, Yohan B, et al. Covid-19 and dengue: double punches for dengue-endemic countries in Asia. *Rev Med Virol*. 2021;31(2):1–9. doi:10.1002/rmv.2161
3. Khan S, Akbar SMF, Yahiro T, et al. Dengue infections during COVID-19 period: reflection of reality or elusive data due to effect of pandemic. *Int J Environ Res Public Health*. 2022;19:17. doi:10.3390/ijerph191710768
4. Wiyono L, Rocha ICN, Cedeno TDD, Miranda AV, Priso DEL. Dengue and COVID-19 infections in the ASEAN region: a concurrent outbreak of viral diseases. *Epidemiol Health*. 2021;43:1–5. doi:10.4178/epih.e2021070
5. Chen Y, Li N, Lourenço J, et al. Measuring the effects of COVID-19-related disruption on dengue transmission in Southeast Asia and Latin America: a statistical modelling study. *Lancet Infect Dis*. 2022;22(5):657–667. doi:10.1016/S1473-3099(22)00025-1
6. Ong SQ, Ahmad H, Ngesom AMM. Implications of the COVID-19 lockdown on Dengue transmission in Malaysia. *Infect Dis Rep*. 2022;13:148. doi:10.3390/idr13010016
7. World Health Organization. The republic of Indonesia health system review. World Health Organization; 2017. Available from: <http://apps.who.int/iris/bitstream/10665/254716/1/9789290225164-eng.pdf>. Accessed January 18, 2023.
8. Sulistiyawati S. *Dengue Prevention and Control in Indonesia: A Case Study in Yogyakarta City*. Sweden: Umeå University; 2022.
9. Sulistiyawati S, Astuti FD, Umniyati SR, et al. Dengue vector control through community empowerment: lessons learned from a community-based study in Yogyakarta, Indonesia. *Int J Environ Res Public Health*. 2019;2019:161013.
10. World Health Organization. A review of entomological sampling methods and indicators for dengue vectors; 2022. Available from: <https://apps.who.int/iris/handle/10665/68575>. Accessed January 18, 2023.
11. Li Y, Zhou G, Zhong S, et al. Spatial heterogeneity and temporal dynamics of mosquito population density and community structure in Hainan Island, China. *Parasit Vectors*. 2022;13(1):1–11.
12. Sulistiyawati S, Mulasari SA, Sukesni TW. Understanding community involvement on Dengue prevention in Sleman, Indonesia: a free listing approach. *J UOEH*. 2020;42(3):231–236. doi:10.7888/juoeh.42.231
13. The Ministry of Health of Indonesia. About the Implementation of dengue prevention and control in the covid-19 pandemic situation (tentang pelaksanaan pencegahan dan pengendalian DBD dalam situasi pandemi covid-19). Jakarta: Ministry of Health of Republic Indonesia; 2020:1–2.
14. Sharma H, Ilyas A, Chowdhury A, et al. Does COVID - 19 lockdowns have impacted on global dengue burden? A special focus to India. *BMC Public Health*. 2022;22:1–23. doi:10.1186/s12889-021-12274-7
15. Mashudi DN, Ahmad N, Said SM. Level of dengue preventive practices and associated factors in a Malaysian residential area during the COVID-19 pandemic: a cross-sectional study. *PLoS One*. 2022;17(4):1–15. doi:10.1371/journal.pone.0267899
16. Adnyana IMDM, Azhari FSS, Sudaryati NLG. Prevalence of dengue hemorrhagic fever in Bali from 2015 to 2020 and during the covid-19 pandemic. *J Berk Epidemiol*. 2022;10(2):169–178. doi:10.20473/jbe.V10I22022.169-178
17. Trisandy AY, Azmi Maruf M, Yudhastuti R, Lusno MFD, Notobroto HB. Large-scale social restriction (LSSR) policy and dengue hemorrhagic fever cases during the Covid-19 pandemic in Indonesia: a case study of five subregions of East Java province. *Kesmas*. 2021;16(1):49–52.
18. Daniel Reegan A, Rajiv Gandhi M, Cruz Asharaja A, Devi C, Shanthakumar SP. COVID-19 lockdown: impact assessment on Aedes larval indices, breeding habitats, effects on vector control programme and prevention of dengue outbreaks. *Heliyon*. 2020;6(10):e05181. doi:10.1016/j.heliyon.2020.e05181
19. Lu X, Bambrick H, Pongsumpun P, Dhewantara PW, Toan DTT, Hu W. Dengue outbreaks in the covid-19 era: alarm raised for Asia. *PLoS Negl Trop Dis*. 2021;15(10):6–11. doi:10.1371/journal.pntd.0009778
20. Rahim MH, Dom NC, Ismail SNS, Mulud ZA, Abdullah S, Pradhan B. The impact of novel coronavirus (2019-nCoV) pandemic movement control order (MCO) on dengue cases in Peninsular Malaysia. *One Heal*. 2021;12:100222. doi:10.1016/j.onehlt.2021.100222
21. Cavany SM, España G, Vazquez-Prokopec GM, Scott TW, Alex Perkins T. Pandemic-associated mobility restrictions could cause increases in dengue virus transmission. *PLoS Negl Trop Dis*. 2021;15(8):1–19. doi:10.1371/journal.pntd.0009603

Risk Management and Healthcare Policy

Dovepress

Publish your work in this journal

Risk Management and Healthcare Policy is an international, peer-reviewed, open access journal focusing on all aspects of public health, policy, and preventative measures to promote good health and improve morbidity and mortality in the population. The journal welcomes submitted papers covering original research, basic science, clinical & epidemiological studies, reviews and evaluations, guidelines, expert opinion and commentary, case reports and extended reports. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/risk-management-and-healthcare-policy-journal>

Risk Management and Healthcare Policy - Corrections received [ID 391933]

1 message

Boon Lee <boonlee@dovepress.com>
Reply-To: Boon Lee <boonlee@dovepress.com>
To: Dr Sulistyawati <sulistyawati.suyanto@ikm.uad.ac.id>

Sat, Jan 21, 2023 at 7:05 PM

Dear Dr Sulistyawati

Thank you for sending the corrections back for your paper Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia [ID 391933], which we have received.

We will be back in touch with you soon with a final proof of your paper.

Kind regards

Boon Lee
Risk Management and Healthcare Policy
Dove Medical Press
www.dovepress.com - open access to scientific and medical research
Dove Medical Press is part of Taylor & Francis Group, the Academic Publishing Division of Informa PLC

boonlee@dovepress.com

PROOF COVER SHEET

Journal: *Risk Management and Healthcare Policy*

Author(s): Sulistyawati Sulistyawati, Herman Yuliansyah, Tri Wahyuni Sukesi, Arfiani Nur Khusna, Surahma Asti Mulasari, Fatwa Tentama, Bambang Sudarsono and Fanani Arief Ghozali

Article title: Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia

Submission no: 391933

Paper citation: Sulistyawati S, Yuliansyah H, Sukesi TW, Khusna AN, Mulasari SA, Tentama F, Sudarsono B, Ghozali FA. Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia. *Risk Management and Healthcare Policy*. In Press 2023

Dear Dr Sulistyawati,

1. Please check these proofs carefully. It is the responsibility of the contact person to check these and approve or amend them as a second proof is not normally provided. This is your chance to highlight any errors or omissions in your paper before it is published.

Please limit changes at this stage to the correction of errors (we would not expect corrections to exceed 30 changes). You should not make minor changes, improve prose style, add new material, or delete existing material at this stage.

2. Please review the table of contributors below and confirm that the names are structured correctly and that the authors are listed in the correct order. This check is to ensure that all author names will appear correctly online and when the article is indexed.

Sequence	First name/given name	Family name/last name
1.	Sulistyawati	Sulistyawati
2.	Herman	Yuliansyah
3.	Tri Wahyuni	Sukesi
4.	Arfiani Nur	Khusna
5.	Surahma Asti	Mulasari
6.	Fatwa	Tentama
7.	Bambang	Sudarsono
8.	Fanani Arief	Ghozali

PubMed Citation: Sulistyawati S, Yuliansyah H, Sukesi TW, Khusna AN, Mulasari SA, Tentama F, Sudarsono B, Ghozali FA

Google Citation: Sulistyawati Sulistyawati, Herman Yuliansyah, Tri Wahyuni Sukesi, Arfiani Nur Khusna, Surahma Asti Mulasari, Fatwa Tentama, Bambang Sudarsono, Fanani Arief Ghozali

To change your PubMed or Google Citation please update your details with a comment in the correction tool.

AUTHOR QUERIES

Please complete the following steps:

1. Read your entire proof and respond to all the Author Queries (AQs) and make necessary amendments directly in the text (avoid leaving instructions/comments unless essential). All AQs must be answered before you submit the corrections to your proof.
2. Please ensure your corrections (if any) are kept to a minimum.
3. Please submit corrections when you are sure you have answered all of the AQs, and have proofread the entire article (including figures and tables).

No Queries

Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia

Sulistiyawati Sulistiyawati¹, Herman Yuliansyah², Tri Wahyuni Sukei¹, Arfiani Nur Khusna², Surahma Asti Mulasari¹, Fatwa Tentama³, Bambang Sudarsono⁴, Fanani Arief Ghozali⁵

¹Faculty of Public Health, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; ²Department of Informatics, Faculty of Industrial Technology, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; ³Faculty of Psychology, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; ⁴Department of Automotive Technology Vocational Education, Faculty of Teacher Training and Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; ⁵Department of Electronics Engineering Vocational Education, Faculty of Teacher Training and Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia

Correspondence: Sulistiyawati Sulistiyawati, Faculty of Public Health, Universitas Ahmad Dahlan, Kampus 3, Jln Prof. Dr. Soepomo, Janturan, Umbulharjo, Yogyakarta, Indonesia, Email sulistiyawati.suyanto@ikm.uad.ac.id

Purpose: This research aimed to observe the gap for improvement in dengue vector control during COVID-19, considering two stakeholders: the government and society. We formulated two research questions: 1) How is the government managing dengue vector control during the COVID-19 pandemic? 2) What is the situation of dengue disease, its vectors, and vector control in the community?

Methods: This study uses multiple approaches: policy review, social listening using Twitter analysis, and interviews. A policy review was employed to capture the journey of dengue vector control in Indonesia from dengue found in Indonesia until the COVID-19 pandemic. Twitter data captured public opinions through social media about dengue and vector control. Interviews involved program implementers that consider knowing the situation in the field of dengue and its vector control. The informant was selected through purposive sampling.

Results: To control dengue disease, the Indonesian government has released regulations about dengue vector control that adjusts the COVID-19 situation, but vector control is still not running optimally, resulting in the data supply for policy not running well.

Conclusion: Dengue cases continued during the COVID-19 pandemic, even in some places stated an outbreak occurred. Vector control does not work correctly during the COVID-19 pandemic due to social restrictions. It is recommended to encourage the implementation of community empowerment through one house, one jumantik, which is equipped with self-reporting to mitigate and respond to similar situations as the pandemic.

Keywords: dengue, COVID-19, vector control, policy, pandemic

Introduction

Dengue is a vector-borne disease caused by the dengue virus carried by the *Aedes aegypti* mosquito.¹ This disease is still a big problem in tropical countries, including Indonesia, which is known to be endemic to this disease. WHO stated that in 2020 – the year that COVID-19 began to spread – several countries, including Indonesia, reported an increase in dengue cases.¹ This indicates that with the emergence of COVID-19, a new challenge in handling dengue disease can even be said to be a double burden for countries that have previously struggled to eradicate dengue.² Several studies indicate that during COVID-19, one of which stated that the number of dengue cases decreased by approximately 16% during the COVID-19 pandemic.³ Reports from some ASEAN countries in 2020 followed a similar pattern: the number of dengue cases in 2020 was lower than in 2019. One of them is Indonesia, where cases were twice as high in 2019 as the previous year (137,760), while it was reported to have decreased in 2020 (95,893).⁴ Furthermore, this needs to be investigated further whether it is due to the lockdown effect so that there is no interaction with positive hosts or underreporting cases^{5,6} or because of people reluctant to health seeking.

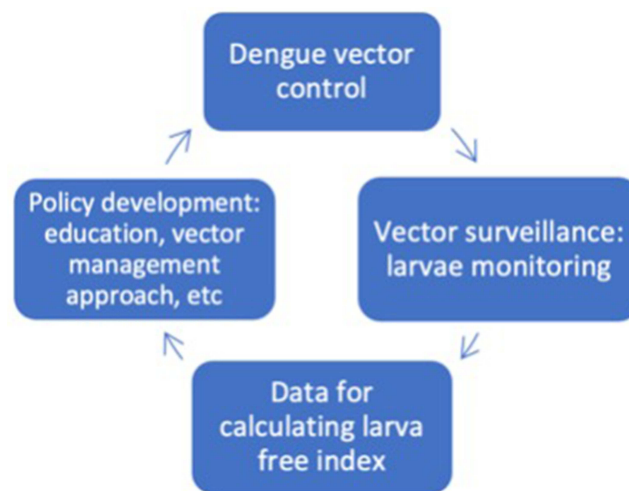


Figure 1 Vector control and policy development framework.

Referring to the existing health system in Indonesia, the Indonesian government adopted a decentralized system. In this context, health programs, including dengue control, are broadly designed by the center and then carried out at lower levels to be adjusted to the context of the region, including in the budget allocation.⁷ If we look further, the dengue program in Indonesia is carried out by two main stakeholders, namely the government as a regulator and the community as both the subject and object of the dengue program.⁸ The government and its staff's domain is to create appropriate programs based on data and implement them with the community.

Indonesia takes vector control through community empowerment in vector monitoring because this program is considered more efficient and offers sustainability.⁹ Vector monitoring is a vital part of vector surveillance which becomes evidence-based for determining the distribution, density, and larval habitats.^{10,11} In Indonesia, vector surveillance is conducted through the Jumantik program, a squad monitoring the existence of larvae by entering the house in the society.^{9,12} Jumantik cadre collects and reports the data in the field periodically to the village, which is forwarded to the health center to calculate the larva indices, including house index, breteau index, and container index, which are considerations in making vector control policies. The role of vector monitoring activity in policy development is presented in Figure 1.

So far, the Jumantik program as vector surveillance has been running well. Nevertheless, problems arise when COVID-19 blows, and the government implements social and physical distancing to limit interaction to avoid COVID-19 transmission. The social restriction impacts the absence of door-to-door larva inspection by the Jumantik cadre. On the other hand, this data is an essential source for determining dengue prevention measures in the community. Based on all backgrounds, we observed the gap for improvement in dengue vector control during COVID-19 from 2 stakeholders, namely the government and society (Figure 2). We formulated two research questions: 1) How is the government managing dengue vector control during the COVID-19 pandemic? 2) What is the situation of dengue disease, its vectors, and vector control in the community?

Materials and Methods

Study Design

This study uses multiple approaches: policy review, social listening using Twitter analysis, and interviews. A policy review was employed to capture the journey of dengue vector control in Indonesia. Twitter data figured out the public opinions about dengue and vector control. Interviews involved dengue program implementers that were selected through purposive sampling. The informant in this study was the person in charge of the dengue program at the primary health center and health office, who was responsible for vector control in society and bridged communication to the health office related to proper dengue intervention in a particular area.



Figure 2 The developed framework used during the research.

Data Source, Data Collection, Sample, and Analysis

The data collection process is summarized in [Table 1](#). We did this research through multiple approaches: policy review, social listening via Twitter, and interview. 70

Ethical Consideration

The ethical approval was given by Universitas Ahmad Dahlan Ethical Board (#012205052). Inform consent was obtained before the interview started. The informant was informed that all analyses performed would be anonymized for publication purposes. 75

Table 1 Data Source, Method of Data Collection, Sample, and Analysis

Domain	Data Source	Method of Data Collection	Sample	Method of Data Analysis
Government - regulator	Policy review	Modification of previous research and addition with dengue vector control in the COVID-19 era	Several policies included since 1968	Document reviews
Society	Social Listening via Twitter	Crawling tweets used Python programming with the Twitter API Key and the keyword “demam berdarah.”	A total of 7419 Tweets were extracted with the time frame of Tweets 22/7/2022-7/8/2022	Data were analyzed using a qualitative approach with thematic analysis to develop a theme.
Program implementer	Interview	Interview using semi-structured interview through face-to-face interview with a purposive sampling among the dengue program implementer	Two dengue program implementers in PHC and health office	Field notes were generated and analyzed using thematic analysis.

Results

Policy Review

These policy reviews were conducted to draw the journey of dengue prevention in Indonesia. This review was a development from previous research conducted by Sulistiyawati (2020),⁸ which was added to the latest policy by the Indonesian government in controlling dengue vectors during the COVID-19 pandemic¹³ (Figure 3). 80

To control dengue, Indonesia has chosen to control the dengue vector in several ways: chemistry, physics, and biology. However, since 1992, chemical control has been gradually reduced and focused on vector control through the movement of cleaning mosquito nests. In 2015 (5 years before the pandemic), the government released the one house one jumantik program, which actively involved the community responsible for cleaning larvae in mosquito breeding sites at their home. Once COVID-19 exploded, the government issued a regulation to adapt to the situation; subsequently, the one house-one Jumantik program was forced with social distancing. 85

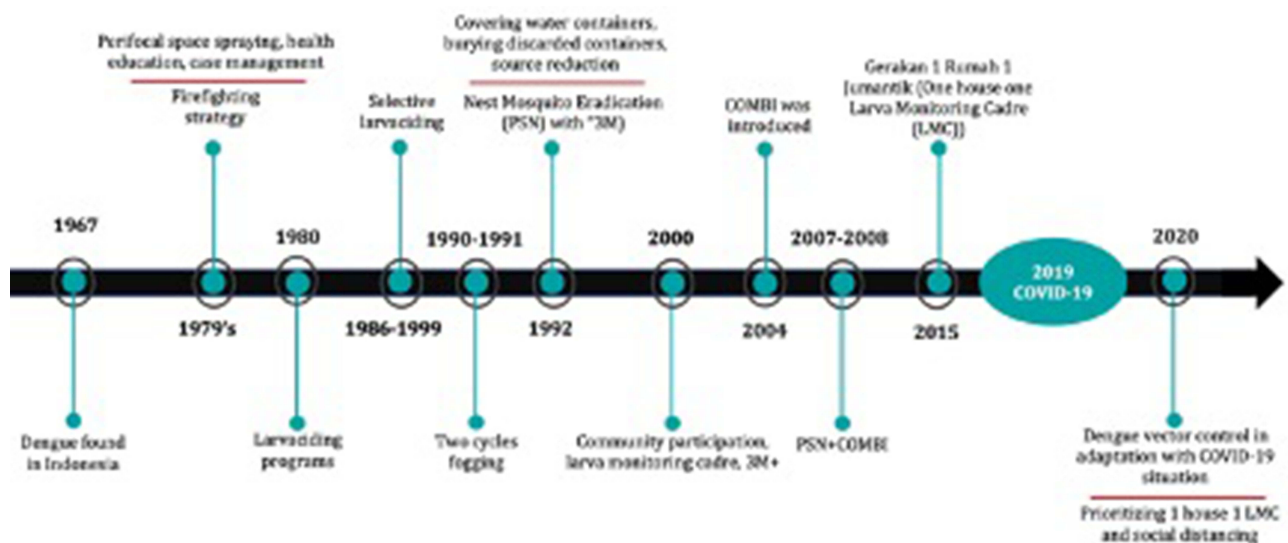


Figure 3 The journey of dengue vector control in Indonesia.

Social Listening Analysis from Twitter

A total of 7419 yields from Twitter. After screening duplicates, we got 2411 tweets included in the analysis. Table 2 summarizes our social listening analysis conducted through Twitter data showing that dengue is still a big problem during the COVID-19 pandemic.

90

Many people provide awareness of dengue because cases in their area are increasing with some types of statements, such as being in dengue season and dengue increase because of overcrowding of population density.

Dengue Cases in Bengawan City Increased Sharply in the Middle of This Year.

The population density in South Jakarta and the shady temperature are the reasons for dengue cases rising (in this location).

Looks like now the dengue season again; my friend is also hospitalized because of dengue; I hope he gets well soon.

95

Dengue Case Increasing, Bekasi City Government Asks the Public to Be Aware.

The category of illness found in society is an abstraction to articulate that dengue incidents still occurred during COVID-19. This was captured from the survivor’s Tweet and those who told us the situation around him.

I went to Bandung when I wasn’t feeling well and ended up with dengue yesterday.

From these symptoms, it’s clear I was attacked by dengue; I hope I’m not hospitalized.

100

Yesterday, on Eid al-Adha, I brought my sister to be treated for dengue.

Next is the category mortality and outbreak occurred, which comes from two subcategories: some dengue patients die, and dengue outbreaks arise in some places. This category illustrates that fatalities happened and, in some areas, declared a dengue outbreak.

Dengue fever case in Asmat Regency has risen dramatically in the past month; the Asmat Regency Government has determined an outbreak of dengue fever.

105

DBD cases in the Yogyakarta City soared as long as two patients died

Many cases of dengue in Solo, some of them die.

During COVID-19, people said they felt anxiety about dengue because of the pain and trauma of experiencing dengue in the past. So, they were afraid of getting infected again; even when they felt dengue symptoms, they were worried.

110

Table 2 Twitter Data Analysis Themes

Theme	Category	Sub-Category
Dengue still be a severe problem during COVID-19	Alertness to dengue	Warning about dengue cases increasing
	Illness found in society.	Suffering from dengue or informed there is positive dengue around them
	Mortality and outbreak occurred.	Dengue patient dies
		Dengue outbreaks occurred in some places.
	Anxiety to dengue	I am feeling pain or trauma because of having dengue in the past.
		Worried because I have the dengue symptoms
	Worries to dengue vector	State a lot of mosquitoes around them
Dengue prevention is still needed.	Doing dengue prevention	

In the next few days, hopefully, it won't be fever anymore because if I still have a fever, I have to go for the blood test. I'm afraid of getting dengue for the second time.

On Monday last week, I was shocked because of a fever; I was afraid of dengue. But after checking in the hospital, thank God I'm fine.

Friends, if you have a brother or nephew who has a fever and red spots appear on the skin and tongue, please run to the hospital immediately. 115

In addition, people expressed their afraid of the pain and symptoms of dengue. They also spoke about concerns or fears with the presence of mosquitoes. However, they did not specifically mention *Aedes aegypti*.

Many mosquitoes make me sick with dengue; I'm suspicious about getting dengue again.

In the first month of class, I got dengue because there were a lot of mosquitoes in my class. 120

Because I got dengue some time ago, I'm terrified of mosquitoes, afraid to open the window, and I always put mosquito repellents.

The last category is that dengue prevention is still being carried out during COVID-19, either educating the public or carrying out actual activities such as fogging.

In order to prevent the spread of dengue fever, mass fogging activities are carried out in the Singgi environment of the Gulling House. 125

The Papua Provincial Health Office (Dinkes) is intensifying counseling on preventing the transmission of dengue fever.

An integrated team from Petojo Selatan village, Gambir sub-district, Central Jakarta, held an eradication of mosquito nests (PSN).

Gap Identified and Interview 130

From two processes of data collection, namely policy review and social listening via Twitter, several problems in dengue control during the COVID-19 pandemic; namely, dengue still occurs in the community during COVID-19. This result was confirmed by an interview informant, a dengue program implementer at the primary health centers, who stated that dengue persisted during COVID-19.

(During COVID-19) Dengue still occurs even though they have decreased compared to 2019. In our PHC, they were 62, 48, and 12 cases for 2019, 2020, and 2021 respectively. (Female, PHC dengue officer) 135

Although the government has issued regulations to prevent dengue during the pandemic, it is not running optimally in society. It was confirmed from the interview with a dengue officer at a primary health center.

(During the pandemic) eradication of mosquito nests (PSN) runs by prioritizing social distancing, but superficially...because Jumantik coordinator only monitors containers outside the house, containers inside the house were asked to the owner. For reporting per house (one house one Jumantik) by homeowners, some reporting some not – usually they reported using WA (Female, PHC dengue officer) 140

Even though the eradication of mosquito nests is trying to be carried out during the pandemic, still, the impact does not have a maximal effect on policy because the manual reporting system cannot run normally. As a result, the data that is the basis for evidence-based policymaking is not well provided. Dengue officers confirmed this at the PHC and the provincial health office. 145

The larva inspection report was working (during the pandemic); the larva free number was also calculated but cannot be used as a reference because it does not represent the situation on the field. (Female, PHC dengue officer)

Reporting of larva inspection does not stop during the pandemic, but the quantity was decreased. So, larva free rate (ABJ) cannot be calculated (Male, Provincial dengue officer)

150

Discussion

Dengue, which is still globally exacerbated by the spread of COVID-19 that has implications for social restrictions, has become a severe problem in Indonesia's routine dengue vector control programs. During the COVID-19 pandemic, the government enforced vector control by emphasizing social distancing. However, this does not seem to be running well either. Seeing this situation, the gap for improvement during COVID-19 in dengue vector control in Indonesia remains unclear. Identifying the dengue situation and the vector control works during a pandemic will facilitate the development of the innovation and may improve responses to currently available interventions.

155

We want to know the gap for improvement between expectation and reality in dengue vector control during the pandemic seen by the government and society. Through a combination of policy review and social listening that triangulate with an interview, we identified that the Indonesian government had issued a regulation on vector control during the pandemic. However, dengue cases still occur in some locations, and even in some locations, outbreaks were declared. Vector control does not run optimally due to social restrictions, so larva inspection reports cannot be used as a reference in decision-making.

160

The dengue case during the pandemic still existed, although it tends to decrease in quantity, this was confirmed by social listening via Twitter and approved by the dengue officer. This result follows another study in Asia, India, Latin America, and Malaysia, which stated that dengue cases during the COVID-19 pandemic decreased, presumably due to limited human movement. Hence, the hosts stayed home, so they did not infect others.^{5,6,14} On the other hand, this decline in cases should also be suspected to the public's reluctance to visit health facilities due to fear of contracting COVID-19.¹⁵ So it could be that the case looks slightly reduced because of the many underreported cases.⁵ However, different conditions were reported by several regions of Indonesia, which stated there was an increase in dengue cases at the beginning of the COVID-19 pandemic, including in Bali and East Java.^{16,17}

165

170

Regarding mosquitoes, this study shows people's complaints about the presence of mosquitoes during COVID-19. People even said there were lots of mosquitoes around them and even felt afraid because they had been infected with dengue. Several studies reported that the COVID-19 pandemic, coupled with social restrictions, caused the increase in mosquito densities^{18,19} due to the stop of dengue vector control movement. This means that the risk of humans being bitten by mosquitoes also increases.²⁰ Accordingly, the mosquito population was difficult to control then the population was increasing.

175

The complaint about the number of mosquitoes was related to the vector control empowerment program not running effortlessly during the COVID-19 pandemic due to social restrictions, as stated by previous research.²¹ Social restriction policy also impacts disease control policies and dengue vectors that rely on larvae inspection data that require entry into the house. Since 2015 the Indonesian government has launched vector control through household-based community empowerment (one house, one jumantik). Still, not all regions have implemented this program – some are entering the socialization phase but have not yet implemented it. In regions that have implemented one house-one jumantik, the data flow from households during the COVID-19 pandemic was not correctly reported, so it is clear that the data supply for policies is disrupted. Therefore, seeing the importance of vector control and the one house one jumantik program as an effective community empowerment model, it is necessary to support an independent reporting system at the household level. Thus, the flow of larva inspection data does not rely on manual report form as has been done so far. This is undoubtedly a momentum to support vector control programs during a pandemic or even after the pandemic as mitigation of similar conditions in the future.

180

185

Conclusion

COVID-19 implies the dengue case and vector control. The society reported that Dengue disease remain occurred during the pandemic. They also stated the existence of mosquitoes around them. The social restriction is associated with disrupting routine vector control that runs inspection by entering the house. This situation impacted the data supply for a policy generally referring to societal larvae monitoring. We recommend developing one house one jumantik reporting system as room for improvement of vector control in adaptation to COVID-19 and social restriction.

190

Acknowledgments

This study has received funding from the Ministry of Education and Culture, the Republic of Indonesia, with grant number 030/PB.PDUPT/BRIn.LPPM/VI/2022. We thank Mrs. Arkana and Mr. Regha from the health office of Yogyakarta for their helpful discussion during the research.

Disclosure

The authors report no conflicts of interest in this work.

References

- World Health Organization. Dengue and severe dengue; 2022. Available from: <https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue>. Accessed January 18, 2023.
- Harapan H, Ryan M, Yohan B, et al. Covid-19 and dengue: double punches for dengue-endemic countries in Asia. *Rev Med Virol*. 2021;31(2):1–9. doi:10.1002/rmv.2161
- Khan S, Akbar SMF, Yahiro T, et al. Dengue infections during COVID-19 period: reflection of reality or elusive data due to effect of pandemic. *Int J Environ Res Public Health*. 2022;19:17. doi:10.3390/ijerph191710768
- Wiyono L, Rocha ICN, Cedeno TDD, Miranda AV, Priso DEL. Dengue and COVID-19 infections in the ASEAN region: a concurrent outbreak of viral diseases. *Epidemiol Health*. 2021;43:1–5. doi:10.4178/epih.e2021070
- Chen Y, Li N, Lourenço J, et al. Measuring the effects of COVID-19-related disruption on dengue transmission in Southeast Asia and Latin America: a statistical modelling study. *Lancet Infect Dis*. 2022;22(5):657–667. doi:10.1016/S1473-3099(22)00025-1
- Ong SQ, Ahmad H, Ngesom AMM. Implications of the COVID-19 lockdown on Dengue transmission in Malaysia. *Infect Dis Rep*. 2022;13:148. doi:10.3390/idr13010016
- World Health Organization. The republic of Indonesia health system review. World Health Organization; 2017. Available from: <http://apps.who.int/iris/bitstream/10665/254716/1/9789290225164-eng.pdf>. Accessed January 18, 2023.
- Sulistiyawati S. *Dengue Prevention and Control in Indonesia: A Case Study in Yogyakarta City*. Sweden: Umeå University; 2022.
- Sulistiyawati S, Astuti FD, Umniyati SR, et al. Dengue vector control through community empowerment: lessons learned from a community-based study in Yogyakarta, Indonesia. *Int J Environ Res Public Health*. 2019;2019:161013.
- World Health Organization. A review of entomological sampling methods and indicators for dengue vectors; 2022. Available from: <https://apps.who.int/iris/handle/10665/68575>. Accessed January 18, 2023.
- Li Y, Zhou G, Zhong S, et al. Spatial heterogeneity and temporal dynamics of mosquito population density and community structure in Hainan Island, China. *Parasit Vectors*. 2022;13(1):1–11.
- Sulistiyawati S, Mulasari SA, Sukesi TW. Understanding community involvement on Dengue prevention in Sleman, Indonesia: a free listing approach. *J UOEH*. 2020;42(3):231–236. doi:10.7888/juoeh.42.231
- The Ministry of Health of Indonesia. About the Implementation of dengue prevention and control in the covid-19 pandemic situation (tentang pelaksanaan pencegahan dan pengendalian DBD dalam situasi pandemi covid-19). Jakarta: Ministry of Health of Republic Indonesia; 2020:1–2.
- Sharma H, Ilyas A, Chowdhury A, et al. Does COVID - 19 lockdowns have impacted on global dengue burden? A special focus to India. *BMC Public Health*. 2022;22:1–23. doi:10.1186/s12889-021-12274-7
- Mashudi DN, Ahmad N, Said SM. Level of dengue preventive practices and associated factors in a Malaysian residential area during the COVID-19 pandemic: a cross-sectional study. *PLoS One*. 2022;17(4):1–15. doi:10.1371/journal.pone.0267899
- Adnyana IMDM, Azhari FSS, Sudaryati NLG. Prevalence of dengue hemorrhagic fever in Bali from 2015 to 2020 and during the covid-19 pandemic. *J Berk Epidemiol*. 2022;10(2):169–178. doi:10.20473/jbe.V10I22022.169-178
- Trisandy AY, Azmi Maruf M, Yudhastuti R, Lusno MFD, Notobroto HB. Large-scale social restriction (LSSR) policy and dengue hemorrhagic fever cases during the Covid-19 pandemic in Indonesia: a case study of five subregions of East Java province. *Kesmas*. 2021;16(1):49–52.
- Daniel Reegan A, Rajiv Gandhi M, Cruz Asharaja A, Devi C, Shanthakumar SP. COVID-19 lockdown: impact assessment on Aedes larval indices, breeding habitats, effects on vector control programme and prevention of dengue outbreaks. *Heliyon*. 2020;6(10):e05181. doi:10.1016/j.heliyon.2020.e05181
- Lu X, Bambrick H, Pongsumpun P, Dhewantara PW, Toan DTT, Hu W. Dengue outbreaks in the covid-19 era: alarm raised for Asia. *PLoS Negl Trop Dis*. 2021;15(10):6–11. doi:10.1371/journal.pntd.0009778
- Rahim MH, Dom NC, Ismail SNS, Mulud ZA, Abdullah S, Pradhan B. The impact of novel coronavirus (2019-nCoV) pandemic movement control order (MCO) on dengue cases in Peninsular Malaysia. *One Heal*. 2021;12:100222. doi:10.1016/j.onehlt.2021.100222
- Cavany SM, España G, Vazquez-Prokopec GM, Scott TW, Alex Perkins T. Pandemic-associated mobility restrictions could cause increases in dengue virus transmission. *PLoS Negl Trop Dis*. 2021;15(8):1–19. doi:10.1371/journal.pntd.0009603

Risk Management and Healthcare Policy

Dovepress

Publish your work in this journal

Risk Management and Healthcare Policy is an international, peer-reviewed, open access journal focusing on all aspects of public health, policy, and preventative measures to promote good health and improve morbidity and mortality in the population. The journal welcomes submitted papers covering original research, basic science, clinical & epidemiological studies, reviews and evaluations, guidelines, expert opinion and commentary, case reports and extended reports. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/risk-management-and-healthcare-policy-journal>

PROOF COVER SHEET

Journal: *Risk Management and Healthcare Policy*

Author(s): Sulistyawati Sulistyawati, Herman Yuliansyah, Tri Wahyuni Sukesi, Arfiani Nur Khusna, Surahma Asti Mulasari, Fatwa Tentama, Bambang Sudarsono and Fanani Arief Ghozali

Article title: Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia

Submission no: 391933

Paper citation: Sulistyawati S, Yuliansyah H, Sukesi TW, Khusna AN, Mulasari SA, Tentama F, Sudarsono B, Ghozali FA. Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia. *Risk Management and Healthcare Policy*. In Press 2023

Dear Dr Sulistyawati,

1. Please check these proofs carefully. It is the responsibility of the contact person to check these and approve or amend them as a second proof is not normally provided. This is your chance to highlight any errors or omissions in your paper before it is published.

Please limit changes at this stage to the correction of errors (we would not expect corrections to exceed 30 changes). You should not make minor changes, improve prose style, add new material, or delete existing material at this stage.

2. Please review the table of contributors below and confirm that the names are structured correctly and that the authors are listed in the correct order. This check is to ensure that all author names will appear correctly online and when the article is indexed.

Sequence	First name/given name	Family name/last name
1.	Sulistyawati	Sulistyawati
2.	Herman	Yuliansyah
3.	Tri Wahyuni	Sukesi
4.	Arfiani Nur	Khusna
5.	Surahma Asti	Mulasari
6.	Fatwa	Tentama
7.	Bambang	Sudarsono
8.	Fanani Arief	Ghozali

PubMed Citation: Sulistyawati S, Yuliansyah H, Sukesi TW, Khusna AN, Mulasari SA, Tentama F, Sudarsono B, Ghozali FA

Google Citation: Sulistyawati Sulistyawati, Herman Yuliansyah, Tri Wahyuni Sukesi, Arfiani Nur Khusna, Surahma Asti Mulasari, Fatwa Tentama, Bambang Sudarsono, Fanani Arief Ghozali

To change your PubMed or Google Citation please update your details with a comment in the correction tool.

AUTHOR QUERIES

Please complete the following steps:

1. Read your entire proof and respond to all the Author Queries (AQs) and make necessary amendments directly in the text (avoid leaving instructions/comments unless essential). All AQs must be answered before you submit the corrections to your proof.
2. Please ensure your corrections (if any) are kept to a minimum.
3. Please submit corrections when you are sure you have answered all of the AQs, and have proofread the entire article (including figures and tables).

No Queries

Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia

Sulistiyawati Sulistiyawati¹, Herman Yuliansyah², Tri Wahyuni Sukei¹, Arfiani Nur Khusna², Surahma Asti Mulasari¹, Fatwa Tentama³, Bambang Sudarsono⁴, Fanani Arief Ghozali⁵

¹Faculty of Public Health, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; ²Department of Informatics, Faculty of Industrial Technology, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; ³Faculty of Psychology, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; ⁴Department of Automotive Technology Vocational Education, Faculty of Teacher Training and Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia; ⁵Department of Electronics Engineering Vocational Education, Faculty of Teacher Training and Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia

Correspondence: Sulistiyawati Sulistiyawati, Faculty of Public Health, Universitas Ahmad Dahlan, Kampus 3, Jln Prof. Dr. Soepomo, Janturan, Umbulharjo, Yogyakarta, Indonesia, Email sulistiyawati.suyanto@ikm.uad.ac.id

Purpose: This research aimed to observe the gap for improvement in dengue vector control during COVID-19, considering two stakeholders: the government and society. We formulated two research questions: 1) How is the government managing dengue vector control during the COVID-19 pandemic? 2) What is the situation of dengue disease, its vectors, and vector control in the community?

Methods: This study uses multiple approaches: policy review, social listening using Twitter analysis, and interviews. A policy review was employed to capture the journey of dengue vector control in Indonesia from dengue found in Indonesia until the COVID-19 pandemic. Twitter data captured public opinions through social media about dengue and vector control. Interviews involved program implementers that consider knowing the situation in the field of dengue and its vector control. The informant was selected through purposive sampling.

Results: To control dengue disease, the Indonesian government has released regulations about dengue vector control that adjusts the COVID-19 situation, but vector control is still not running optimally, resulting in the data supply for policy not running well.

Conclusion: Dengue cases continued during the COVID-19 pandemic, even in some places stated an outbreak occurred. Vector control does not work correctly during the COVID-19 pandemic due to social restrictions. It is recommended to encourage the implementation of community empowerment through one house, one jumantik, which is equipped with self-reporting to mitigate and respond to similar situations as the pandemic.

Keywords: dengue, COVID-19, vector control, policy, pandemic

Introduction

Dengue is a vector-borne disease caused by the dengue virus carried by the *Aedes aegypti* mosquito.¹ This disease is still a big problem in tropical countries, including Indonesia, which is known to be endemic to this disease. WHO stated that in 2020 – the year that COVID-19 began to spread – several countries, including Indonesia, reported an increase in dengue cases.¹ This indicates that with the emergence of COVID-19, a new challenge in handling dengue disease can even be said to be a double burden for countries that have previously struggled to eradicate dengue.² Several studies indicate that during COVID-19, one of which stated that the number of dengue cases decreased by approximately 16% during the COVID-19 pandemic.³ Reports from some ASEAN countries in 2020 followed a similar pattern: the number of dengue cases in 2020 was lower than in 2019. One of them is Indonesia, where cases were twice as high in 2019 as the previous year (137,760), while it was reported to have decreased in 2020 (95,893).⁴ Furthermore, this needs to be investigated further whether it is due to the lockdown effect so that there is no interaction with positive hosts or underreporting cases^{5,6} or because of people reluctant to health seeking.

Referring to the existing health system in Indonesia, the Indonesian government adopted a decentralized system. In this context, health programs, including dengue control, are broadly designed by the center and then carried out at lower levels to be adjusted to the context of the region, including in the budget allocation.⁷ If we look further, the dengue program in Indonesia is carried out by two main stakeholders, namely the government as a regulator and the community as both the subject and object of the dengue program.⁸ The government and its staff's domain is to create appropriate programs based on data and implement them with the community.

Indonesia takes vector control through community empowerment in vector monitoring because this program is considered more efficient and offers sustainability.⁹ Vector monitoring is a vital part of vector surveillance which becomes evidence-based for determining the distribution, density, and larval habitats.^{10,11} In Indonesia, vector surveillance is conducted through the Jumantik program, a squad monitoring the existence of larvae by entering the house in the society.^{9,12} Jumantik cadre collects and reports the data in the field periodically to the village, which is forwarded to the health center to calculate the larva indices, including house index, breteau index, and container index, which are considerations in making vector control policies. The role of vector monitoring activity in policy development is presented in Figure 1.

So far, the Jumantik program as vector surveillance has been running well. Nevertheless, problems arise when COVID-19 blows, and the government implements social and physical distancing to limit interaction to avoid COVID-19 transmission. The social restriction impacts the absence of door-to-door larva inspection by the Jumantik cadre. On the other hand, this data is an essential source for determining dengue prevention measures in the community. Based on all backgrounds, we observed the gap for improvement in dengue vector control during COVID-19 from 2 stakeholders, namely the government and society (Figure 2). We formulated two research questions: 1) How is the government managing dengue vector control during the COVID-19 pandemic? 2) What is the situation of dengue disease, its vectors, and vector control in the community?

Materials and Methods

Study Design

This study uses multiple approaches: policy review, social listening using Twitter analysis, and interviews. A policy review was employed to capture the journey of dengue vector control in Indonesia. Twitter data figured out the public opinions about dengue and vector control. Interviews involved dengue program implementers that were selected through purposive sampling. The informant in this study was the person in charge of the dengue program at the primary health

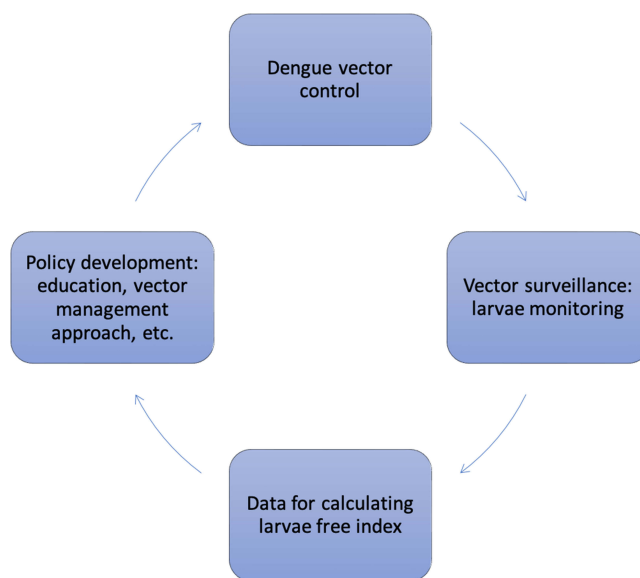


Figure 1 Vector control and policy development framework.



Figure 2 The developed framework used during the research.

center and health office, who was responsible for vector control in society and bridged communication to the health office related to proper dengue intervention in a particular area.

Data Source, Data Collection, Sample, and Analysis

The data collection process is summarized in Table 1. We did this research through multiple approaches: policy review, social listening via Twitter, and interview.

Ethical Consideration

The ethical approval was given by Universitas Ahmad Dahlan Ethical Board (#012205052). Inform consent was obtained before the interview started. The informant was informed that all analyses performed would be anonymized for publication purposes.

Results

Policy Review

These policy reviews were conducted to draw the journey of dengue prevention in Indonesia. This review was a development from previous research conducted by Sulistiyawati (2020),⁸ which was added to the latest policy by the Indonesian government in controlling dengue vectors during the COVID-19 pandemic¹³ (Figure 3).

To control dengue, Indonesia has chosen to control the dengue vector in several ways: chemistry, physics, and biology. However, since 1992, chemical control has been gradually reduced and focused on vector control through the movement of cleaning mosquito nests. In 2015 (5 years before the pandemic), the government released the one house one jumantik program, which actively involved the community responsible for cleaning larvae in mosquito breeding sites at their home. Once COVID-19 exploded, the government issued a regulation to adapt to the situation; subsequently, the one house-one Jumantik program was forced with social distancing.

Social Listening Analysis from Twitter

A total of 7419 yields from Twitter. After screening duplicates, we got 2411 tweets included in the analysis. Table 2 summarizes our social listening analysis conducted through Twitter data showing that dengue is still a big problem during the COVID-19 pandemic.

Many people provide awareness of dengue because cases in their area are increasing with some types of statements, such as being in dengue season and dengue increase because of overcrowding of population density.

Dengue Cases in Bengawan City Increased Sharply in the Middle of This Year.

Table 1 Data Source, Method of Data Collection, Sample, and Analysis

Domain	Data Source	Method of Data Collection	Sample	Method of Data Analysis
Government - regulator	Policy review	Modification of previous research and addition with dengue vector control in the COVID-19 era	Several policies included since 1968	Document reviews
Society	Social Listening via Twitter	Crawling tweets used Python programming with the Twitter API Key and the keyword "demam berdarah."	A total of 7419 Tweets were extracted with the time frame of Tweets 22/7/2022-7/8/2022	Data were analyzed using a qualitative approach with thematic analysis to develop a theme.
Program implementer	Interview	Interview using semi-structured interview through face-to-face interview with a purposive sampling among the dengue program implementer	Two dengue program implementers in PHC and health office	Field notes were generated and analyzed using thematic analysis.

The population density in South Jakarta and the shady temperature are the reasons for dengue cases rising (in this location).

Looks like now the dengue season again; my friend is also hospitalized because of dengue; I hope he gets well soon.

95

Dengue Case Increasing, Bekasi City Government Asks the Public to Be Aware.

The category of illness found in society is an abstraction to articulate that dengue incidents still occurred during COVID-19. This was captured from the survivor's Tweet and those who told us the situation around him.

I went to Bandung when I wasn't feeling well and ended up with dengue yesterday.

From these symptoms, it's clear I was attacked by dengue; I hope I'm not hospitalized.

100

Yesterday, on Eid al-Adha, I brought my sister to be treated for dengue.

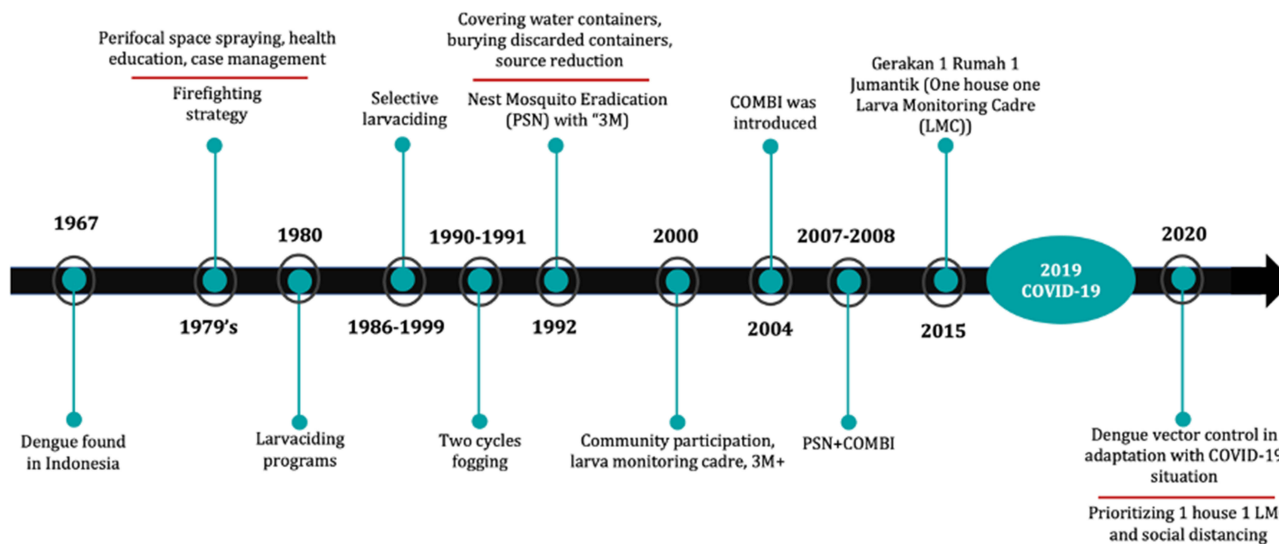


Figure 3 The journey of dengue vector control in Indonesia.

Next is the category mortality and outbreak occurred, which comes from two subcategories: some dengue patients die, and dengue outbreaks arise in some places. This category illustrates that fatalities happened and, in some areas, declared a dengue outbreak.

Dengue fever case in Asmat Regency has risen dramatically in the past month; the Asmat Regency Government has determined an outbreak of dengue fever. 105

DBD cases in the Yogyakarta City soared as long as two patients died

Many cases of dengue in Solo, some of them die.

During COVID-19, people said they felt anxiety about dengue because of the pain and trauma of experiencing dengue in the past. So, they were afraid of getting infected again; even when they felt dengue symptoms, they were worried. 110

In the next few days, hopefully, it won't be fever anymore because if I still have a fever, I have to go for the blood test. I'm afraid of getting dengue for the second time.

On Monday last week, I was shocked because of a fever; I was afraid of dengue. But after checking in the hospital, thank God I'm fine.

Friends, if you have a brother or nephew who has a fever and red spots appear on the skin and tongue, please run to the hospital immediately. 115

In addition, people expressed their afraid of the pain and symptoms of dengue. They also spoke about concerns or fears with the presence of mosquitoes. However, they did not specifically mention *Aedes aegypti*.

Many mosquitoes make me sick with dengue; I'm suspicious about getting dengue again.

In the first month of class, I got dengue because there were a lot of mosquitoes in my class. 120

Because I got dengue some time ago, I'm terrified of mosquitoes, afraid to open the window, and I always put mosquito repellents.

The last category is that dengue prevention is still being carried out during COVID-19, either educating the public or carrying out actual activities such as fogging.

Table 2 Twitter Data Analysis Themes

Theme	Category	Sub-Category
Dengue still be a severe problem during COVID-19	Alertness to dengue	Warning about dengue cases increasing
	Illness found in society.	Suffering from dengue or informed there is positive dengue around them
	Mortality and outbreak occurred.	Dengue patient dies
		Dengue outbreaks occurred in some places.
	Anxiety to dengue	I am feeling pain or trauma because of having dengue in the past.
		Worried because I have the dengue symptoms
	Worries to dengue vector	State a lot of mosquitoes around them
Dengue prevention is still needed.	Doing dengue prevention	

In order to prevent the spread of dengue fever, mass fogging activities are carried out in the Singgi environment of the Gulling House. 125

The Papua Provincial Health Office (Dinkes) is intensifying counseling on preventing the transmission of dengue fever.

An integrated team from Petojo Selatan village, Gambir sub-district, Central Jakarta, held an eradication of mosquito nests (PSN).

Gap Identified and Interview 130

From two processes of data collection, namely policy review and social listening via Twitter, several problems in dengue control during the COVID-19 pandemic; namely, dengue still occurs in the community during COVID-19. This result was confirmed by an interview informant, a dengue program implementer at the primary health centers, who stated that dengue persisted during COVID-19.

(During COVID-19) Dengue still occurs even though they have decreased compared to 2019. In our PHC, they were 62, 48, and 12 cases for 2019, 2020, and 2021 respectively. (Female, PHC dengue officer) 135

Although the government has issued regulations to prevent dengue during the pandemic, it is not running optimally in society. It was confirmed from the interview with a dengue officer at a primary health center.

(During the pandemic) eradication of mosquito nests (PSN) runs by prioritizing social distancing, but superficially...because Jumantik coordinator only monitors containers outside the house, containers inside the house were asked to the owner. For reporting per house (one house one Jumantik) by homeowners, some reporting some not – usually they reported using WA (Female, PHC dengue officer) 140

Even though the eradication of mosquito nests is trying to be carried out during the pandemic, still, the impact does not have a maximal effect on policy because the manual reporting system cannot run normally. As a result, the data that is the basis for evidence-based policymaking is not well provided. Dengue officers confirmed this at the PHC and the provincial health office. 145

The larva inspection report was working (during the pandemic); the larva free number was also calculated but cannot be used as a reference because it does not represent the situation on the field. (Female, PHC dengue officer)

Reporting of larva inspection does not stop during the pandemic, but the quantity was decreased. So, larva free rate (ABJ) cannot be calculated (Male, Provincial dengue officer) 150

Discussion

Dengue, which is still globally exacerbated by the spread of COVID-19 that has implications for social restrictions, has become a severe problem in Indonesia's routine dengue vector control programs. During the COVID-19 pandemic, the government enforced vector control by emphasizing social distancing. However, this does not seem to be running well either. Seeing this situation, the gap for improvement during COVID-19 in dengue vector control in Indonesia remains unclear. Identifying the dengue situation and the vector control works during a pandemic will facilitate the development of the innovation and may improve responses to currently available interventions. 155

We want to know the gap for improvement between expectation and reality in dengue vector control during the pandemic seen by the government and society. Through a combination of policy review and social listening that triangulate with an interview, we identified that the Indonesian government had issued a regulation on vector control during the pandemic. However, dengue cases still occur in some locations, and even in some locations, outbreaks were declared. Vector control does not run optimally due to social restrictions, so larva inspection reports cannot be used as a reference in decision-making. 160

The dengue case during the pandemic still existed, although it tends to decrease in quantity, this was confirmed by social listening via Twitter and approved by the dengue officer. This result follows another study in Asia, India, Latin 165

America, and Malaysia, which stated that dengue cases during the COVID-19 pandemic decreased, presumably due to limited human movement. Hence, the hosts stayed home, so they did not infect others.^{5,6,14} On the other hand, this decline in cases should also be suspected to the public's reluctance to visit health facilities due to fear of contracting COVID-19.¹⁵ So it could be that the case looks slightly reduced because of the many underreported cases.⁵ However, different conditions were reported by several regions of Indonesia, which stated there was an increase in dengue cases at the beginning of the COVID-19 pandemic, including in Bali and East Java.^{16,17} 170

Regarding mosquitoes, this study shows people's complaints about the presence of mosquitoes during COVID-19. People even said there were lots of mosquitoes around them and even felt afraid because they had been infected with dengue. Several studies reported that the COVID-19 pandemic, coupled with social restrictions, caused the increase in mosquito densities^{18,19} due to the stop of dengue vector control movement. This means that the risk of humans being bitten by mosquitoes also increases.²⁰ Accordingly, the mosquito population was difficult to control then the population was increasing. 175

The complaint about the number of mosquitoes was related to the vector control empowerment program not running effortlessly during the COVID-19 pandemic due to social restrictions, as stated by previous research.²¹ Social restriction policy also impacts disease control policies and dengue vectors that rely on larvae inspection data that require entry into the house. Since 2015 the Indonesian government has launched vector control through household-based community empowerment (one house, one jumantik). Still, not all regions have implemented this program – some are entering the socialization phase but have not yet implemented it. In regions that have implemented one house-one jumantik, the data flow from households during the COVID-19 pandemic was not correctly reported, so it is clear that the data supply for policies is disrupted. Therefore, seeing the importance of vector control and the one house one jumantik program as an effective community empowerment model, it is necessary to support an independent reporting system at the household level. Thus, the flow of larva inspection data does not rely on manual report form as has been done so far. This is undoubtedly a momentum to support vector control programs during a pandemic or even after the pandemic as mitigation of similar conditions in the future. 180 185

Conclusion

COVID-19 implies the dengue case and vector control. The society reported that Dengue disease remain occurred during the pandemic. They also stated the existence of mosquitoes around them. The social restriction is associated with disrupting routine vector control that runs inspection by entering the house. This situation impacted the data supply for a policy generally referring to societal larvae monitoring. We recommend developing one house one jumantik reporting system as room for improvement of vector control in adaptation to COVID-19 and social restriction. 190

Acknowledgments

This study has received funding from the Ministry of Education and Culture, the Republic of Indonesia, with grant number 030/PB.PDUPT/BRIn.LPPM/VI/2022. We thank Mrs. Arkana and Mr. Regha from the health office of Yogyakarta for their helpful discussion during the research. 195

Disclosure

The authors report no conflicts of interest in this work.

References

1. World Health Organization. Dengue and severe dengue; 2022. Available from: <https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue>. Accessed January 18, 2023. 200
2. Harapan H, Ryan M, Yohan B, et al. Covid-19 and dengue: double punches for dengue-endemic countries in Asia. *Rev Med Virol*. 2021;31(2):1–9. doi:10.1002/rmv.2161
3. Khan S, Akbar SMF, Yahiro T, et al. Dengue infections during COVID-19 period: reflection of reality or elusive data due to effect of pandemic. *Int J Environ Res Public Health*. 2022;19:17. doi:10.3390/ijerph191710768 205
4. Wiyono L, Rocha ICN, Cedeno TDD, Miranda AV, Priso DEL. Dengue and COVID-19 infections in the ASEAN region: a concurrent outbreak of viral diseases. *Epidemiol Health*. 2021;43:1–5. doi:10.4178/epih.e2021070
5. Chen Y, Li N, Lourenço J, et al. Measuring the effects of COVID-19-related disruption on dengue transmission in Southeast Asia and Latin America: a statistical modelling study. *Lancet Infect Dis*. 2022;22(5):657–667. doi:10.1016/S1473-3099(22)00025-1 210

6. Ong SQ, Ahmad H, Ngesom AMM. Implications of the COVID-19 lockdown on Dengue transmission in Malaysia. *Infect Dis Rep.* 2022;13:148. doi:10.3390/idr13010016
7. World Health Organization. The republic of Indonesia health system review. World Health Organization; 2017. Available from: <http://apps.who.int/iris/bitstream/10665/254716/1/9789290225164-eng.pdf>. Accessed January 18, 2023.
8. Sulistiyawati S. *Dengue Prevention and Control in Indonesia: A Case Study in Yogyakarta City*. Sweden: Umeå University; 2022. 215
9. Sulistiyawati S, Astuti FD, Umniyati SR, et al. Dengue vector control through community empowerment: lessons learned from a community-based study in Yogyakarta, Indonesia. *Int J Environ Res Public Health.* 2019;2019:161013.
10. World Health Organization. A review of entomological sampling methods and indicators for dengue vectors; 2022. Available from: <https://apps.who.int/iris/handle/10665/68575>. Accessed January 18, 2023.
11. Li Y, Zhou G, Zhong S, et al. Spatial heterogeneity and temporal dynamics of mosquito population density and community structure in Hainan Island, China. *Parasit Vectors.* 2022;13(1):1–11. 220
12. Sulistiyawati S, Mulasari SA, Sukesni TW. Understanding community involvement on Dengue prevention in Sleman, Indonesia: a free listing approach. *J UOEH.* 2020;42(3):231–236. doi:10.7888/juoch.42.231
13. The Ministry of Health of Indonesia. About the Implementation of dengue prevention and control in the covid-19 pandemic situation (tentang pelaksanaan pencegahan dan pengendalian DBD dalam situasi pandemi covid-19). Jakarta: Ministry of Health of Republic Indonesia; 2020:1–2. 225
14. Sharma H, Ilyas A, Chowdhury A, et al. Does COVID - 19 lockdowns have impacted on global dengue burden? A special focus to India. *BMC Public Health.* 2022;22:1–23. doi:10.1186/s12889-021-12274-7
15. Mashudi DN, Ahmad N, Said SM. Level of dengue preventive practices and associated factors in a Malaysian residential area during the COVID-19 pandemic: a cross-sectional study. *PLoS One.* 2022;17(4):1–15. doi:10.1371/journal.pone.0267899
16. Adnyana IMDM, Azhari FSS, Sudaryati NLG. Prevalence of dengue hemorrhagic fever in Bali from 2015 to 2020 and during the covid-19 pandemic. *J Berk Epidemiol.* 2022;10(2):169–178. doi:10.20473/jbe.V10I22022.169-178 230
17. Trisandy AY, Azmi Maruf M, Yudhastuti R, Lusno MFD, Notobroto HB. Large-scale social restriction (LSSR) policy and dengue hemorrhagic fever cases during the Covid-19 pandemic in Indonesia: a case study of five subregions of East Java province. *Kesmas.* 2021;16(1):49–52.
18. Daniel Reegan A, Rajiv Gandhi M, Cruz Asharaja A, Devi C, Shanthakumar SP. COVID-19 lockdown: impact assessment on Aedes larval indices, breeding habitats, effects on vector control programme and prevention of dengue outbreaks. *Heliyon.* 2020;6(10):e05181. doi:10.1016/j.heliyon.2020.e05181 235
19. Lu X, Bambrick H, Pongsumpun P, Dhewantara PW, Toan DTT, Hu W. Dengue outbreaks in the covid-19 era: alarm raised for Asia. *PLoS Negl Trop Dis.* 2021;15(10):6–11. doi:10.1371/journal.pntd.0009778
20. Rahim MH, Dom NC, Ismail SNS, Mulud ZA, Abdullah S, Pradhan B. The impact of novel coronavirus (2019-nCoV) pandemic movement control order (MCO) on dengue cases in Peninsular Malaysia. *One Heal.* 2021;12:100222. doi:10.1016/j.onehlt.2021.100222 240
21. Cavany SM, España G, Vazquez-Prokopec GM, Scott TW, Alex Perkins T. Pandemic-associated mobility restrictions could cause increases in dengue virus transmission. *PLoS Negl Trop Dis.* 2021;15(8):1–19. doi:10.1371/journal.pntd.0009603

Risk Management and Healthcare Policy

Dovepress

Publish your work in this journal

Risk Management and Healthcare Policy is an international, peer-reviewed, open access journal focusing on all aspects of public health, policy, and preventative measures to promote good health and improve morbidity and mortality in the population. The journal welcomes submitted papers covering original research, basic science, clinical & epidemiological studies, reviews and evaluations, guidelines, expert opinion and commentary, case reports and extended reports. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/risk-management-and-healthcare-policy-journal>

Risk Management and Healthcare Policy Author approval [ID: 391933]

1 message

Boon Lee <boonlee@dovepress.com>
Reply-To: Boon Lee <boonlee@dovepress.com>
To: Dr Sulistyawati <sulistyawati.suyanto@ikm.uad.ac.id>

Wed, Feb 1, 2023 at 3:18 AM

Dear Dr Sulistyawati

Thank you, we have received approval for your paper "Rapid Appraisals of the Transformation Strategy Required to Sustain Dengue Vector Control During and After the COVID-19 Pandemic in Indonesia".

We will arrange to have the paper prepared for publication. An email will be sent to you when your paper has been published on our website.

Do contact me if you have any questions:
Live Support https://www.dovepress.com/live_help.t
Email: boonlee@dovepress.com
Phone: +64-9-443 3060

Kind regards

Boon Lee
Risk Management and Healthcare Policy
Dove Medical Press
Dove Medical Press is part of Taylor & Francis Group, the Academic Publishing Division of Informa PLC
www.dovepress.com - open access to scientific and medical research

Your manuscript is published

1 message

Boon Lee <boonlee@dovepress.com>
Reply-To: Boon Lee <boonlee@dovepress.com>
To: Dr Sulistyawati <sulistyawati.suyanto@ikm.uad.ac.id>

Wed, Feb 1, 2023 at 7:45 PM

Dear Dr Sulistyawati

I am happy to advise that your typeset manuscript has just been published in its final form on our website. You can view and download it here: https://www.dovepress.com/articles.php?article_id=81395.

Don't forget to register for email alerts to this journal by clicking here:

https://www.dovepress.com/quick_signup.php?journal_id=56&l=f9w6FjplmWtf2rX2jRdMfFEI1362211

Your paper has now completed our production processes. To help us improve our service we would be interested in your feedback on your experience. Please take a moment to respond to our quick author survey here:

<https://survey.alchemer.eu/s3/90252044/Dove-Medical-Press-author-survey-production?ac=RMHP&subid=391933&fa=n&pr=y&jnl=Risk+Management+and+Healthcare+Policy&art=Rapid+Appraisals+of+the+Transformation+Strategy+Required+to+Sustain+Dengue+Vector+Control+During+and+After+the+COVID-19+Pandemic+in+Indonesia>

You may have already answered a survey after the peer review and revised manuscript process. This is a separate survey about your experience of the production processes, and we would appreciate your feedback.

A summary of views your paper has received will be sent to all authors of this paper on a regular basis.

If you were happy with your publishing experience please recommend Dove Medical Press with a Google review by clicking this link <https://goo.gl/mZF3Nr> or alternatively you can give us a Facebook review here

<https://www.facebook.com/DoveMedicalPress?sk=reviews>

Create and download a personalised banner to promote your published article https://www.dovepress.com/promote_your_published_article.php.

I would like to take this opportunity to personally thank you for your contribution to Risk Management and Healthcare Policy. It was a pleasure working with you and I hope we can do so again in the near future.

Yours sincerely

Boon Lee
Production Coordinator
Dove Medical Press Ltd
Dove Medical Press is part of Taylor & Francis Group, the Academic Publishing Division of Informa PLC
www.dovepress.com - open access to scientific and medical research
ID: 391933

Dove Medical Press: Submission accepted for publication2 messages

Ms Sandi McIver <sandi@dovepress.com>
Reply-To: Ms Sandi McIver <sandi@dovepress.com>
To: Dr Sulistyawati <sulistyawati.suyanto@ikm.uad.ac.id>

Mon, Jan 16, 2023 at 4:11 AM

Dear Dr Sulistyawati,

I am pleased to inform you that the submission, "Rapid appraisals of the transformation strategy required to sustain Dengue vector control during and after the COVID-19 pandemic in Indonesia", has been accepted for publication in "Risk Management and Healthcare Policy". The article publishing charge is now payable before the paper can be progressed any further and an invoice is accessible here: https://www.dovepress.com/invoice.php?i_key=EfsUlsK2mxvpWzIyPJzxJloI63846
(If you require any amendments to your invoice please reply to this email. Please note invoices cannot be amended once a payment has been made)

The above acceptance for publication is conditional upon the required copyright permissions being obtained, if applicable.

The fee can be paid by credit card (Visa, MasterCard or AMEX) or bank transfer*. Instructions are given below, which we strongly recommend you read before organizing payment.

Paying by credit card:

Click on the URL given above to be taken to our secure credit card payment gateway. Because credit card payments are immediate, we recommend using this method to ensure that processing of your paper continues promptly. When processing your payment through the secure credit card system you will need to remain on the payment pages until the transaction has completed – either successful or failed. Do not close your browser during this time.

Paying by bank transfer:

Please forward the invoice accessible through the URL given above together with this information to your organization's accounts administrator:

Bank transfer details:

BNP Paribas London
10 Harewood Avenue, London, NW1 6AA

Account name: Dove Medical Press Ltd
Account No.: 87810020 (This account is for USD transactions only)
Sort code: 40-63-84
VAT No.: GB 365 462 636
IBAN: GB70BNPA40638487810020
SWIFT BIC: BNPAGB22
CORRESPONDENT: BNPAUS3N (Intermediary Bank)

IMPORTANT NOTES WHEN PAYING BY BANK TRANSFER:

* Bank transfer costs: If paying by bank transfer you must ensure that the full amount of the invoice is transferred to Dove Medical Press. Any bank fees should be at the senders expense as under-payment of your invoice will result in delays to your paper being published.

- Please instruct your accounts administrator to include your submission ID in the payment information provided when the transfer is initiated.

PLEASE NOTE: We do not accept payment by check.

Receipts:

If you require a receipt please let me know.

The acceptance of your paper is subject to all outstanding content-related queries being addressed to the satisfaction of the Publisher.

If you have any questions about your paper please contact us at any time, we welcome your feedback.

Yours sincerely

Ms Sandi Mclver
Dove Medical Press
www.dovepress.com - open access to scientific and medical research
Dove Medical Press is part of Taylor & Francis Group, the Academic Publishing Division of Informa PLC
391933

Note: By having your paper accepted for publication you agree to our terms of publication which, amongst other things, require that:

- 1) Your paper should be unique and not published elsewhere. If you have reused or adapted figures, tables or sections of text from papers published elsewhere you must approach the copyright owner (normally the journal publisher and not the author) and obtain their permission to re-use those elements;
- 2) Your paper should not be under consideration by any other journal or publisher; and
- 3) You should advise us immediately if you have received any financial or other support from a commercial organisation in the preparation of this manuscript; and
- 4) The Editor-in-Chief or their Associate Editor may, at their sole discretion, cancel the acceptance of any paper. In the event of a refund of the article publishing charge Dove Medical Press will retain EUR278, GBP230 or US\$300 to cover transaction and processing costs.

sulistyawati suyanto <sulistyawati.suyanto@ikm.uad.ac.id>
To: Ms Sandi Mclver <sandi@dovepress.com>

Tue, Jan 17, 2023 at 9:22 AM

Dear Ms. Sandi Mclver,

With this email, I am sending the bank transfer receipt of APC to my article.

Best regards,

Sulistyawati, MPH., Ph.D.

Department of Public Health, Universitas Ahmad Dahlan, Indonesia


+62-8170402693 | sulistyawati.suyanto@ikm.uad.ac.id

<https://www.scopus.com/authid/detail.uri?authorId=55956961800>

<https://www.researchgate.net/profile/Sulistyawati-Sulistyawati>

<https://orcid.org/0000-0002-7299-0360>

[Quoted text hidden]

 **Bank Transfer Receipt.pdf**
18737K