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www.plos.org

Dr. Dewi Anggraini
Universitas Lambung Mangkurat Fakultas Matematika dan Ilmu Pengetahuan Alam
Banjarbaru
South Kalimantan, INDONESIA

20th February 2020

To Whom It May Concern,

This letter is to certify that Dr. Dewi Anggraini is an active reviewer for the journal *PLOS ONE*. They have reviewed one paper for *PLOS ONE* since October 2019.

PLOS ONE (plosone.org) is a scholarly, peer-reviewed journal published by the Public Library of Science (PLOS), a leading not-for-profit publisher of Open Access journals. The journal launched in 2006 and its editorial criteria focus is on the technical quality of the work rather than on any subjective judgments, such as perceived impact or relevance to a specialist field. *PLOS ONE* rigorously peer reviews original scientific manuscripts; we seek evaluations by reviewers with research expertise in the scientific area covered in the manuscript.

We are grateful to Dr. Anggraini for their contribution to *PLOS ONE*.

Please do not hesitate to contact us at plosone@plos.org with any questions or inquiries you may have.

Sincerely,

Joerg Heber
Editor-in-Chief
PLOS ONE

UNIVERSITAS LAMBUNG MANGKURAT

Dewi Anggraini <dewi.anggraini@ulm.ac.id>

Dr. Solomon Assefa Woreta invites you to review PLOS ONE manuscript PONE-D-19-27564 - [EMID:b886040c958fe2dd]

3 messages

PLOS ONE <em@editorialmanager.com> Tue, Oct 22, 2019 at 9:45 PM
Reply-To: PLOS ONE <plosone@plos.org>
To: Dewi Anggraini <dewi.anggraini@ulm.ac.id>

Dear Ms Anggraini,

I am writing to invite you to review a manuscript for PLOS ONE entitled "Regional Disparities in Antenatal Care Utilization in Indonesia" (PONE-D-19-27564).

The author list and abstract are appended below, plus more detailed information about PLOS ONE and its editorial criteria.

If you accept this assignment, you are committing to a confidential review process. Reviewers may not share or act upon any confidential information gained in the review process. More information about confidentiality in the review process is available here. You are also confirming that you have no competing interests that may affect your ability to provide an objective evaluation. Our Competing Interests policy can be found here.

Beginning May 22, 2019, authors may choose to make the Peer Review History of their article publicly available on publication. As a result, your peer review form responses and comments may be made public if this manuscript was submitted after May 22nd and the author chooses to opt in to the service.

This manuscript was submitted on Oct 15 2019 05:41PM. If you accept this assignment:

- you acknowledge that we may publish your review under a CC BY license, in accordance with our Terms of Use (https://www.plos.org/terms-of-use).
- you will have the option to consent to have your name disclosed. Providing consent to disclose your name is not a condition to accepting this assignment.
    - If you provide consent, your name will be made public if the author chooses to publish their Peer Review History.
    - If you choose not to provide consent to have your name disclosed, your review may still be made public if the author chooses to publish their Peer Review History and PLOS will continue to use your personal information for other purposes, as described in our Privacy Policy https://www.plos.org/privacy-policy

In accordance with the launch of peer review history at PLOS, we have updated our Privacy Policy to inform you, as reviewer, about how PLOS will process your personal information if you consent to disclose your identity and about your right to withdraw consent. The updated Privacy Policy will go into effect May 22, 2019. Please read the updated Privacy Policy.

If you **ACCEPT** to review this paper, please click the following link: Agree to Review

I would appreciate receiving your review within 10 calendar days of your acceptance.

If you **DECLINE** to review this paper, please click the following link: Decline to Review

PLOS ONE employs a structured reviewer form to help reviewers focus on our publication criteria. We encourage you to read about the form. You can also visit the PLOS Reviewer Center for peer review guides, tips, and other resources.

If you have any questions or concerns, please contact us at plosone@plos.org.

With kind regards,
Dr. Solomon Assefa Woreta
Academic Editor

Manuscript #: PONE-D-19-27564
Title: Regional Disparities in Antenatal Care Utilization in Indonesia

Authors: Agung Dwi Laksono; Rukmini Rukmini; Ratna Dwi Wulandari, Dr

ABSTRACT:

Introduction: The main strategy for decreasing maternal morbidity and mortality has been antenatal care (ANC). ANC aims to monitor and maintain the health and safety of the mother and the fetus, detect all complications of pregnancy and take the necessary actions, respond to complaints, prepare for birth, and promote a healthy lifestyle. This study aims to analyze interregional disparities in ≥4 ANC visits during pregnancy in Indonesia.
Methods: Data was acquired from the 2017 Indonesian Demographic and Health Survey (IDHS). The unit of analysis was women aged 15-49 years old, and a sample of 15,351 women was obtained. In addition to ANC as the dependent variable, the other variables analyzed in this study were place of residence, age, husband/partner, education, parity, wealth status, and health insurance. For the final analysis, binary logistic regression was used to determine disparity.
Results: With the Papua region as a reference, all regions showed a gap except for the Maluku region, which was not significantly different in the use of ANC compared to the Papua region. Women in the Nusa Tenggara have 4.365 times the chance of making ≥4 ANC visits compared to those in the Papua region. Women in Java-Bali have 3,607 times the chance of making ≥4 ANC visits compared to women in the Papua region. Women in Sumatra have 1,370 times the chance of making ≥4 ANC visits compared to women in the Papua region. Women in Kalimantan have 2.232 times the chance of making ≥4 ANC visits compared to women in the Papua region. Women in Sulawesi have 1,980 times more chance of making ≥4 ANC visits compared to women in the Papua region. In addition to the region category, other variables that contributed to the predictor were age, husband/partner, education, parity, wealth and insurance.
Conclusion: There were disparities in ANC utilization between the various regions of Indonesia.

Dewi Anggraini <dewi.anggraini@ulm.ac.id> Tue, Oct 22, 2019 at 10:08 PM
To: Mali Abdollahian <mali.abdollahian@rmit.edu.au>

Dear Mali,

I have got invitation to review a journal in PLoS One, the top high rank journal in Medicine with H index 268 Q1 (https://www.scimagojr.com/journalsearch.php?q=10600153309&tip=sid&clean=0).

I just accepted it since the article is written by Indonesian and about Antenatal Care in Indonesia.

I hope this is the way for us to publish an article in PLoS ONE, maybe our manuscript about fetal growth chart or other topics.

What do you think Mali?

Kind regards,
Dewi

Lecturer
Department of Statistics
Faculty of Mathematics and Natural Sciences
University of Lambung Mangkurat
Banjarbaru, South Kalimantan, Indonesia
[Quoted text hidden]

Mali Abdollahian <mali.abdollahian@rmit.edu.au> Wed, Oct 23, 2019 at 3:49 PM
To: Dewi Anggraini <dewi.anggraini@ulm.ac.id>

Fantastic Dewi, sure go ahead and do it.

[Quoted text hidden]

UNIVERSITAS LAMBUNG MANGKURAT

Dewi Anggraini <dewi.anggraini@ulm.ac.id>

PLOS ONE: Agreement to Review PONE-D-19-27564 - [EMID:b34c56a9a28edeb6]

1 message

PLOS ONE <em@editorialmanager.com> Tue, Oct 22, 2019 at 10:06 PM
Reply-To: PLOS ONE <plosone@plos.org>
To: Dewi Anggraini <dewi.anggraini@ulm.ac.id>

Manuscript Number: PONE-D-19-27564
Manuscript Title: Regional Disparities in Antenatal Care Utilization in Indonesia

Dear Ms Anggraini,

Thank you for agreeing to review manuscript PONE-D-19-27564, entitled "Regional Disparities in Antenatal Care Utilization in Indonesia".

To download the paper now, please click this link: View Submission

Your review due date is Nov 01 2019 11:59PM EST.

PLOS ONE employs a structured reviewer form to help reviewers focus on our publication criteria. If you have not used this form previously, we encourage you to learn more here. Please contact us at plosone@plos.org with any questions. You can also visit the PLOS Reviewer Center for peer review guides, tips, and other resources.

You may submit your comments online at Submit Recommendation. It is very important to submit your review through the electronic system rather than by email. If you do not have your username and password, they can be retrieved by clicking the *Send Username/Password* button in Editorial Manager.

We would also like to remind you about the PLOS ONE editorial criteria, which focus on the technical aspects of a study rather than more subjective evaluations of issues like 'impact' or 'interest level'. In essence, PLOS ONE wishes to publish ANY report of scientific research that will make a valid contribution to the scientific record.

To be accepted for publication in PLOS ONE, research articles must satisfy the following criteria:

1. The study presents the results of original research.
2. Results reported have not been published elsewhere.
3. Experiments, statistics, and other analyses are performed to a high technical standard and are described in sufficient detail.
4. Conclusions are presented in an appropriate fashion and are supported by the data.
5. The article is presented in an intelligible fashion and is written in standard English.
6. The research meets all applicable standards for the ethics of experimentation and research integrity.
7. The article adheres to appropriate reporting guidelines and community standards for data availability.

Therefore, your evaluation of this submission and your recommendation to the Academic Editor should focus on the scientific soundness of the work. Concerns that the work is lacking in novelty, impact, or interest should not be taken into account. Please visit our website for more information about PLOS ONE.

For additional guidance, please visit our reviewer guidelines.

With kind regards,

PLOS ONE
plosone@plos.org

Note: An iCalendar file is attached to this email which can be used to set a reminder for this review on your default calendar (Outlook, Apple Calendar, Google Calendar, etc.).

Review_Due.ics
1K

UNIVERSITAS LAMBUNG MANGKURAT

Dewi Anggraini <dewi.anggraini@ulm.ac.id>

Review assignment for PONE-D-19-27564 is due soon - [EMID:33e8b08435a99a7c]

2 messages

PLOS ONE <em@editorialmanager.com> Tue, Oct 29, 2019 at 12:59 PM
Reply-To: PLOS ONE <plosone@plos.org>
To: Dewi Anggraini <dewi.anggraini@ulm.ac.id>

PONE-D-19-27564
Regional Disparities in Antenatal Care Utilization in Indonesia
PLOS ONE

Dear Ms Anggraini,

Thank you for agreeing to submit a review on PLOS ONE manuscript "Regional Disparities in Antenatal Care Utilization in Indonesia." As a reminder, your review is due by Nov 01 2019 11:59PM EST and can be submitted at https://www.editorialmanager.com/pone/.

If you are unable to submit your comments by the due date mentioned, please be aware that the Academic Editor may proceed to render a decision based on his or her own evaluation of the manuscript or reviews received, in an effort to provide a timely review process. If you would like step-by-step instructions for submitting your review, please see this 2-minute video tutorial: https://www.youtube.com/watch?v=SnQ5daJcM0Q. You can also visit the PLOS Reviewer Center for peer review guides, tips, and other resources: http://reviewers.plos.org.

To download the paper now, please click this link: https://www.editorialmanager.com/pone/l.asp?i=36360077&l=P7SC6RNE

To submit your review, please follow this link: https://www.editorialmanager.com/pone/l.asp?i=36360080&l=G2K5HEA6

We appreciate your support for PLOS ONE. Please do not hesitate to contact us if you have any questions or concerns.

Kind regards,

PLOS ONE
plosone@plos.org

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In compliance with data protection regulations, you may request that we remove your personal registration details at any time. (Use the following URL: https://www.editorialmanager.com/PONE/login.asp?a=r). Please contact the publication office if you have any questions.

Dewi Anggraini <dewi.anggraini@ulm.ac.id> Wed, Oct 30, 2019 at 12:44 PM
To: PLOS ONE <plosone@plos.org>

Dear PLOS ONE,

I will submit the results of the review by the due date.

Thank you.
Kind regards,
Dewi Anggraini

Lecturer
Department of Statistics
Faculty of Mathematics and Natural Sciences
University of Lambung Mangkurat
Banjarbaru, South Kalimantan, Indonesia

[Quoted text hidden]

UNIVERSITAS LAMBUNG MANGKURAT

Dewi Anggraini <dewi.anggraini@ulm.ac.id>

Re: Review assignment for PONE-D-19-27564

1 message

plosone <plosone@plos.org> Wed, Oct 30, 2019 at 6:41 PM
To: "dewi.anggraini@ulm.ac.id" <dewi.anggraini@ulm.ac.id>

Dear Ms Anggraini,

Thank you for contacting PLOS ONE and for advising us of your plans to submit your review. I have made a note on our system that you will be submitting your review comments and recommendation shortly. Please do accept my apologies, but you may continue to receive our automated reminder emails in the meantime.

If you have any questions or we can be of any assistance, please do not hesitate to contact us.

We look forward to receiving your comments.

Kind regards,

Sue Laborda
Staff EO
PLOS ONE

Case Number: 06452833
ref:_00DU0Ifis._5004Pzrd6G:ref

---------- Original Message ----------
From: Dewi Anggraini [dewi.anggraini@ulm.ac.id]
Sent: 10/30/2019 4:44 AM
To: plosone@plos.org
Subject: Re: Review assignment for PONE-D-19-27564 is due soon - [EMID:33e8b08435a99a7c]

Dear PLOS ONE,

I will submit the results of the review by the due date.

Thank you.
Kind regards,
Dewi Anggraini

Lecturer
Department of Statistics
Faculty of Mathematics and Natural Sciences
University of Lambung Mangkurat
Banjarbaru, South Kalimantan, Indonesia

On Tue, Oct 29, 2019 at 12:58 PM PLOS ONE <em@editorialmanager.com> wrote:

> PONE-D-19-27564
> Regional Disparities in Antenatal Care Utilization in Indonesia
> PLOS ONE
>
> Dear Ms Anggraini,
>
> Thank you for agreeing to submit a review on PLOS ONE manuscript "Regional Disparities in Antenatal Care Utilization in Indonesia." As a reminder, your review is due by Nov 01 2019 11:59PM EST and can be submitted at https://www.editorialmanager.com/pone/.
>
> If you are unable to submit your comments by the due date mentioned, please be aware that the Academic Editor may proceed to render a decision based on his or her own evaluation of the manuscript or reviews received, in an effort to provide a timely review process. If you would like step-by-step instructions for submitting your review, please see this 2-minute video tutorial: https://www.youtube.com/watch?v=SnQ5daJcM0Q. You can also visit the PLOS Reviewer Center for peer review guides, tips, and other resources: http://reviewers.plos.org.

To download the paper now, please click this link: https://www.editorialmanager.com/pone/l.asp?i=36360077&l=P7SC6RNE

To submit your review, please follow this link: https://www.editorialmanager.com/pone/l.asp?i=36360080&l=G2K5HEA6

We appreciate your support for PLOS ONE. Please do not hesitate to contact us if you have any questions or concerns.

Kind regards,

PLOS ONE
plosone@plos.org

_____

UNIVERSITAS LAMBUNG MANGKURAT

Dewi Anggraini <dewi.anggraini@ulm.ac.id>

Thank you for the review of PONE-D-19-27564 - [EMID:b7b0a27d603ad494]

1 message

PLOS ONE <em@editorialmanager.com> Fri, Nov 1, 2019 at 5:11 PM
Reply-To: PLOS ONE <plosone@plos.org>
To: Dewi Anggraini <dewi.anggraini@ulm.ac.id>

PONE-D-19-27564
Regional Disparities in Antenatal Care Utilization in Indonesia
Dr Ratna Dwi Wulandari

Dear Ms Anggraini,

Thank you for taking the time to review PLOS ONE manuscript PONE-D-19-27564 'Regional Disparities in Antenatal Care Utilization in Indonesia.' We greatly appreciate your assistance.

To access a copy of your submitted comments please navigate to the 'Completed Assignments' folder of the Reviewer Main Menu in your Editorial Manager account. Once the editor has proceeded to make a decision you can expect to receive a notification.

PLOS is conducting a short survey about protocols and reproducibility. Begin the survey by selecting an answer below:

On average, how long do you usually spend reviewing a manuscript?

1-3 hours: https://surveys.plos.org/s3/pone-how-long-review?answer=1-3
4-7 hours: https://surveys.plos.org/s3/pone-how-long-review?answer=4-7
7-10 hours: https://surveys.plos.org/s3/pone-how-long-review?answer=7-10
10+ hours: https://surveys.plos.org/s3/pone-how-long -review ?answer=10plus

Thank you for your support of PLOS ONE.

Kind regards,
PLOS ONE
plosone@plos.org

UNIVERSITAS LAMBUNG MANGKURAT

Dewi Anggraini <dewi.anggraini@ulm.ac.id>

A decision has been made on PONE-D-19-27564 - [EMID:95c3864a334cc332]

2 messages

PLOS ONE <em@editorialmanager.com> Mon, Nov 18, 2019 at 10:32 PM
Reply-To: PLOS ONE <plosone@plos.org>
To: Dewi Anggraini <dewi.anggraini@ulm.ac.id>

Ref.: Ms. No. PONE-D-19-27564
Regional Disparities in Antenatal Care Utilization in Indonesia
PLOS ONE

Dear Ms Anggraini,

Thank you for your review of this manuscript. The Editor has made a decision on this paper and has asked the Author to revise the submission. You may be asked to review the revision of this paper in the future.

A copy of the decision letter can be found below.

You can also access your review comments and the decision letter by logging onto Editorial Manager as a Reviewer.

To: ********
From: "PLOS ONE" plosone@plos.org
Subject: PLOS ONE Decision: Revision required [PONE-D-19-27564]

PONE-D-19-27564
Regional Disparities in Antenatal Care Utilization in Indonesia
PLOS ONE

Dear Dr. Ratna Dwi,

Thank you for submitting your manuscript to PLOS ONE. After careful consideration, we feel that it has merit but does not fully meet PLOS ONE's publication criteria as it currently stands. Therefore, we invite you to submit a revised version of the manuscript that addresses the points raised during the review process.

==========

I would like to applause the authors for taking this initiative to research the regional disparity of Antenatal Care Utilization in the study area. As it has been indicated in this study ANC is the best strategy to uphold the well-being of the mothers, the unborn baby and to perpetuate healthy and productive generation.
Being said that, the following are point by point comments need further revision.
Abstract:
This section precisely illustrate and expound the entire study. But there is enumeration discrepancy in the result section. Perhaps, this would be due to, I believe, an honest typing errors. In fact, it would be good to have the confidence interval in each regression analysis to demonstrate the estimate computed from the statistics of the observed data and to clearly show where the estimate laid. On the other hand, the main purpose of any research is to identify the pre-existing gap or problem and recommend based on the study finding. It appears to be there is no recommendation incorporated in the section. It would be great to include a brief recommendation under conclusion.
Introduction:
In general, this section encompass necessary facts that provide important information related to ANC service in various regions in Indonesia. However, it didn't include literature of similar study from different countries with the same setting. Having those literature will help to visualize the gap existed in this study area and in order to draw the right argument in the discussion section.
Methods:
• What was your inclusion and exclusion criteria to select the variables from IDHS?
• What was your operation definition for your dependent variable (ANC utilization)?
• You need to clearly depict the methods or criteria employed in this study to interpret and identify regional discrepancy.
• It would be very important to have a brief description related to other important variables that could have direct or indirect impact in this the study.
Result:
This section need further work up. Here are some of my observation you need to pay attention to.
• What is your rationale to merge regression analysis with socio-demographic characteristics?
• Make sure you separate the socio-demographic characteristics with those sub titles in this section.

• Make sure you address the objective clearly.
• I assume ANC utilization is considered as a dependent variable and more than two independent variable have been included as well in this study, then why your analysis clogged on binary logistic regression. Don't you think additional analysis would help to refine your result?
• There is inconsistency throughout this section.
• I recommend to conduct multiple logistic regression analysis to provide concrete result to assert the disparity.
Other than this, I don't see any issue in the write up in this section, but as I indicated above the analysis appears to be incomplete.
In General, the result section could impact the discussion and conclusion section.
Discussion:
Well written with clear and evidence based argument. However, this would be an overdue until complete analysis conducted.

Even though, the conclusion section looks well written, I assume you will further rewrite after reanalysis.

==========

We would appreciate receiving your revised manuscript by Jan 02 2020 11:59PM. When you are ready to submit your revision, log on to https://www.editorialmanager.com/pone/ and select the 'Submissions Needing Revision' folder to locate your manuscript file.

If you would like to make changes to your financial disclosure, please include your updated statement in your cover letter.

To enhance the reproducibility of your results, we recommend that if applicable you deposit your laboratory protocols in protocols.io, where a protocol can be assigned its own identifier (DOI) such that it can be cited independently in the future. For instructions see: http://journals.plos.org/plosone/s/submission-guidelines#loc-laboratory-protocols

Please include the following items when submitting your revised manuscript:

- A rebuttal letter that responds to each point raised by the academic editor and reviewer(s). This letter should be uploaded as separate file and labeled 'Response to Reviewers'.
- A marked-up copy of your manuscript that highlights changes made to the original version. This file should be uploaded as separate file and labeled 'Revised Manuscript with Track Changes'.
- An unmarked version of your revised paper without tracked changes. This file should be uploaded as separate file and labeled 'Manuscript'.

Please note while forming your response, if your article is accepted, you may have the opportunity to make the peer review history publicly available. The record will include editor decision letters (with reviews) and your responses to reviewer comments. If eligible, we will contact you to opt in or out.

We look forward to receiving your revised manuscript.

Kind regards,

Solomon Assefa Woreta
Academic Editor
PLOS ONE

Journal Requirements:

1. When submitting your revision, we need you to address these additional requirements.

Please ensure that your manuscript meets PLOS ONE's style requirements, including those for file naming. The PLOS ONE style templates can be found at

http://www.journals.plos.org/plosone/s/file?id=wjVg/PLOSOne_formatting_sample_main_body.pdf and
http://www.journals.plos.org/plosone/s/file?id=ba62/PLOSOne_formatting_sample_title_authors_affiliations.pdf

2. Please correct your reference to "p=0.000" to "p<0.001" or as similarly appropriate, as p values cannot equal zero.

3. We note that you have indicated that data from this study are available upon request. PLOS only allows data to be available upon request if there are legal or ethical restrictions on sharing data publicly. For information on unacceptable data access restrictions, please see http://journals.plos.org/plosone/s/data-availability#loc-unacceptable-data-access-restrictions.

* In your revised cover letter, please address the following prompts:

a) If there are ethical or legal restrictions on sharing a de-identified data set, please explain them in detail (e.g., data contain potentially identifying or sensitive patient information) and who has imposed them (e.g., an ethics committee). Please also provide contact information for a data access committee, ethics committee, or other institutional body to which data requests may be sent.

b) If there are no restrictions, please upload the minimal anonymized data set necessary to replicate your study findings as either Supporting Information files or to a stable, public repository and provide us with the relevant URLs, DOIs, or accession numbers. Please see http://www.bmj.com/content/340/bmj.c181.long for guidelines on how to de-identify and prepare clinical data for publication. For a list of acceptable repositories, please see http://journals.plos.org/plosone/s/data-availability#loc-recommended-repositories.

We will update your Data Availability statement on your behalf to reflect the information you provide.

Additional Editor Comments (if provided):

I would like to applause the authors for taking this initiative to research the regional disparity of Antenatal Care Utilization in the study area. As it has been indicated in this study ANC is the best strategy to uphold the well-being of the mothers, the unborn baby and to perpetuate healthy and productive generation.
Being said that, the following are point by point comments need further revision.
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Discussion:
Well written with clear and evidence based argument. However, this would be an overdue until complete analysis conducted.

[Note: HTML markup is below. Please do not edit.]

Reviewers' comments:

Reviewer's Responses to Questions

Comments to the Author

1. Is the manuscript technically sound, and do the data support the conclusions?

The manuscript must describe a technically sound piece of scientific research with data that supports the conclusions. Experiments must have been conducted rigorously, with appropriate controls, replication, and sample sizes. The conclusions must be drawn appropriately based on the data presented.

Reviewer #1: Partly

Reviewer #2: Yes

---

2. Has the statistical analysis been performed appropriately and rigorously?

Reviewer #1: Yes

Reviewer #2: Yes

---

3. Have the authors made all data underlying the findings in their manuscript fully available?

The PLOS Data policy requires authors to make all data underlying the findings described in their manuscript fully available without restriction, with rare exception (please refer to the Data Availability Statement in the manuscript PDF file). The data should be provided as part of the manuscript or its supporting information, or deposited to a public repository. For example, in addition to summary statistics, the data points behind means, medians and variance measures should be available. If there are restrictions on publicly sharing data—e.g. participant privacy or use of data from a third party—those must be specified.

Reviewer #1: Yes

Reviewer #2: Yes

---

4. Is the manuscript presented in an intelligible fashion and written in standard English?

PLOS ONE does not copyedit accepted manuscripts, so the language in submitted articles must be clear, correct, and unambiguous. Any typographical or grammatical errors should be corrected at revision, so please note any specific errors here.

Reviewer #1: Yes

Reviewer #2: Yes

---

5. Review Comments to the Author

Please use the space provided to explain your answers to the questions above. You may also include additional comments for the author, including concerns about dual publication, research ethics, or publication ethics. (Please upload your review as an attachment if it exceeds 20,000 characters)

Reviewer #1: Overall:
Although this study does not demonstrate the advance in the field, the manuscript has been identified as original study with 16% similarity index. The authors have used large and sufficient amount of secondary data that can be

accessed online but with registration and permission only through the link: https://dhsprogram.com/data/available-datasets.cfm. Overall, the authors have summarized the main research question and key findings. Authors have also identified other literature on the topic and explain how the study relates to this previously published research. However, the authors should put more explanation on the rationale and significance of this study, particularly in the introduction. The figures and tables are clear, readable, and support the findings. There are only some captions and labels need further clarifications. The presentation of figures and tables are appropriate for the type of data being presented. There is no experiments or interventions used in this study since the authors collected the data from the 2017 Indonesian Demographic Data Survey (IDHS) that can be access online subject to registration and permission to use the data. The authors have used enough qualitative data to draw a conclusion and addressed possible limitations of the research. The process of collecting data, selecting variables of the study, and analyzing the data still needs further details to allow other researchers to fully replicate or recreate the analysis and validate the study. The authors have followed best practices for reporting and conformed to ethical guidelines. The authors have used one or more of the highly qualified native English speaking editors at American Journal Experts (AJE) to edit the manuscript for proper English language, grammar, punctuation, spelling, and overall style. The results of this study support the conclusions even though some of them could not be justified directly from the results. The authors briefly mentioned about the limitation of this study. The statistical analysis was adequate but needs more details on the assumption that we need to meet for each single type of statistical test to ensure the validity of the results. The summary data presented in the manuscript have provided enough evidence for the author's conclusions although the necessary data points can only be accessed online with registration and permission.

Below is given point-by-point comments to the manuscript:

Title:
The title has been clear and concise but there is inconsistency in writing the title between in the cover page (Regional Disparities in Antenatal Care Utilization in Indonesia) and the first page of the original manuscript (Regional Disparities of Antenatal Care Utilization in Indonesia).

Abstract
The abstract has mentioned the main objective of the study, explained how the study was done, summarized some important results but less explanation on their rationale and significance.

Introduction:
In the last sentence: This study aims to analyze interregional disparities in ANC utilization with ≥ 4 visits during pregnancy in Indonesia.

Methods:
This research has used secondary data derived from IDHS 2017. The data are accessible online through https://dhsprogram.com/data/available-datasets.cfm but with registration and permission.
You have missed to mention about the use of principal component analysis and chi-square in your analysis here.

Results:
1st sentence: ……in the use of ANC with ≥ 4 visits compared to……..

Conclusion:
……. in ANC utilization with ≥ 4 visits between …..

There is inconsistency in the number of variables cause disparity in the ANC utilization ≥ 4 visits in Indonesia mentioned in the conclusion (abstract) (6) and the conclusion (main manuscript) (10).

Keywords:
Antenatal care utilization, contributing factors, regional disparity, Indonesia.

Main Manuscript
Introduction
The introduction does not provide sufficient background that puts the manuscript into context. This is because:
1. Some information between paragraphs is not well-linkage so that it is difficult to understand the rationale, purpose, and significance of the study.
2. Lack of data and review of key literature regarding disparity in the ANC utilization to show what the problem with disparity, why it is important to be addressed, and controversies or disagreements in the field.
These result in unclear statement of the overall aim and significance of the study.

Below some disconnections found in every paragraph in the Introduction:

1st paragraph:
You can simply said:
"In the 2015-2019 National Medium-Term Development Plan, Indonesia has targeted to increase the distribution equity and quality of health services by the end of 2019". Then you can combined and continue this sentence with the

second paragraph like: “The target can be determined by three indicators, namely …..”.

2nd paragraph:
You mentioned about three indictors to increase the distribution equity and quality of health services and there is no linkage information to the use of ANC with ≥ 4 visits.

3rd paragraph:
You mentioned about target of mortality rates with no further linkage to the effort of increasing the distribution equity and quality of health services.

4th paragraph:
You mentioned about disparities in maternal deaths among districts/cities in Indonesia which the highest is in Eastern Indonesia and the risk factors that most influenced maternal mortality, including low coverage of four pregnancy visits. This is good information and try to connect it with what you have written in the 5th paragraph.

5th paragraph:
You have introduced ANC as the main strategy for reducing maternal mortality and morbidity but please check the structure of the 1st sentence. I would recommend if you can write it as “Antenatal care (ANC) is the main strategy to decrease maternal morbidity and mortality”.

You also mentioned a good information about the increase use of ANC and its variation (disparity) among populations groups due to geographical, demographic, socioeconomic, and cultural differences that result in the decrease of access to service as well as its quality and affordability.

6th paragraph:
You mentioned some statistics showing the increase proportion of ANC utilization (1st and 4th visits) and identified that the quality of ANC services needs further improvement. After that, however, you put some information that does not link with what you have said in the previous 1st and 2nd lines. The information perhaps can be used in Discussion rather than in the Introduction.

7th paragraph:
The aim of study was to analyze disparity in the utilization of ANC with ≥ 4 visits to provide clear directions for the Health Ministry to complete regional priority data in an effort to reduce maternal mortality. However, it is not clear enough on how you could provide directions to the Ministry, what regional priority data is for and the connection with the reduction of maternal mortality. Please further explain them in the discussion so that you can answer your research question.

You have mentioned in the 6th paragraph that the quality of ANC services needs to be improved. How this relates to the utilization of ANC with ≥ 4 visits?

Methods
Data Source
Since you are using secondary data from IDHS which can be accessed online with registration/permission, there is no need to explain too much detail on the sampling design of the survey, except you did the “real” survey. The sampling design has been perhaps explained in details in reference no 13, so you do not need to repeat that again here. In this part, you should provide enough detail on how (the procedures) you get the data from IDHS, what variables that you use (dependent and independent variables), how to select them, and how many data you get from the IDHS to answer your research question to allow suitably skilled investigators to fully replicate your study. Please mention here that you have obtained the permission to use the data for the purpose of the study.

Procedure
Since you are using secondary data from IDHS and not conducting the “real” survey, there is no need to explain the ethical clearance of conducting the survey.

I do not think this sub section “Procedure” is needed since you are not dealing with primary data or experimental study.

Data Analysis
The explanation about variables used in the study can be placed under “Data Source” as I mentioned earlier.

In this section, you should you provide sufficient information on how you analyze the data. This includes how the principal component analysis was used to calculate the score; how to arrange the national wealth quintiles; how to select variables that related to the frequency of ANC utilization using the chi-square test, including the assumption that we need to meet; and how to determine disparity using binary logistic regression to allow suitably skilled investigators to fully replicate your study.

I could not see the use of chi-square test and principal component analysis in your results.
Results
1st paragraph:

Fig. 1 caption: “Distribution of ANC utilization percentage with ≥ 4 visits across 34 provinces in Indonesia”.
Legend: “Antenatal care with ≥ 4 visits”

I would suggest that the 1st sentence will be written as following:
“According to Fig. 1, the eastern part of Indonesia (Maluku and Papua regions) has the lowest percentage of ANC utilization with ≥ 4 visits (< 75.64%). This was higher in the western part of Indonesia (Sumatera), recorded from 75.65% to 92.74% and best centered in the central part of Indonesia (Java-Bali), > 92.74%”.

2nd paragraph:
The first sentence: The statistical description, calculated in counts (%), of female ……

The second sentence: Table 1 shows that there are statistically significant socio-demographic differences between regions. Also, please mention here or in the “Methods” which category of variables become references.

You should also explain why the 34 provinces are divided into 7 regions in the “Methods”.

Table 1:
In the 9th column, please change the label “All” to “Total”.

In the last column, please put “p-value” instead of “P” which in Statistics can be meant proportion. Also, provide information of what test statistics used for testing the differences among regions and the testing criteria in “Methods”.

3rd and 4th paragraphs:
Please combine them into one paragraph.

5th paragraph:
The third sentence: Typo “Table 3” should be “Table 2”; “…….and shows no differences……”

6th paragraph:
The first sentence: “…….differences in the ANC utilization with ≥ 4 visits is …….”

The second sentence: “……..Nusa Tenggara region were 4.365 times more likely to have ≥ 4 ANC visits compared…..”

7th paragraph:
Combine this paragraph with the 6th paragraph.

8th paragraph:
Please be aware of the use of articles “a”.

The fourth sentence: “…….has a lower tendency to utilize ANC ≥ 4 visits than…..”.
Table 2: I suggest the label for column “≥ 4 ANC visits” to be “ANC utilization with ≥ 4 visits”.

9th paragraph:
Please combine the 1st and 2nd sentences together, so that “Table 2 indicates that women who have a husband/partner have 2.107 times higher chance of utilizing ANC ≥ 4 visits compared to women who do not have a husband/partner (OR 2.107; 95%CI 1.674-2.651)”.

Please be aware of the use of articles “a” in the 9th and 11th paragraphs.

Please combine the 9th to the 13th paragraph into one concise summary.

Discussion
Please combine some of paragraphs that contain less than 3 sentences or add more sentences to make a proper paragraph.

Please explain the 3rd paragraph using simpler language.

Conclusion
Here, you have mentioned 10 variables that contributed to disparities in ANC utilization among women in Indonesia to make ≥ 4 visits. This number is inconsistent with what you have written in the conclusion of the abstract. Some of the variables, such as “not being able to read”, “not being exposed to the media”, “never using the Internet”, “not knowing the signs of danger related to pregnancy”, and “a belief in traditional birth attendants”, may need more explanation and justification in the results to avoid overreach conclusion.

Reviewer #2: Reviewer’s report

Title: Regional Disparities in Antenatal Care Utilization in Indonesia

Version: 1 Date: 1 Nov 2019

Reviewer: I Wayan Gede Artawan Eka Putra

Abstract:
The results need to shorten and use effective sentence.
Please provide also the main implication of this study in the conclusion

Background section:
Need further argumentation about the using of category ≥4 ANC and why is it important?

Methods section is well written.

Results section:
Table 1&2: If p value on the analysis results is 0.000 please write <0.001 on the table.
If p value had been written in the table than the foot note is not necessary.

Table 2: Please provide the reference category of each variable so will be easier to interpret the table.

The age categorization need to be simpler for example divided into 3 categories <20, 20-34, and ≥35 years old.

Discussion Section:
Need further discussion regarding the implication of main result to improve antenatal care utilization in Indonesia. This discussion will be a guidance to write specific recommendations.

The second and third paragraph in discussion section may be merged into one paragraph.

Conclusion:
The recommendation need to be specify, therefor the discussion regarding the implications of main results were important to build a specific recommendation. This will be the main massage of this study.

Declaration of competing interests: I declare that I have no competing interests.

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6. PLOS authors have the option to publish the peer review history of their article (what does this mean?). If published, this will include your full peer review and any attached files.

If you choose “no”, your identity will remain anonymous but your review may still be made public.

Do you want your identity to be public for this peer review? For information about this choice, including consent withdrawal, please see our Privacy Policy.

Reviewer #1: No

Reviewer #2: Yes: I Wayan Gede Artawan Eka Putra

[NOTE: If reviewer comments were submitted as an attachment file, they will be attached to this email and accessible via the submission site. Please log into your account, locate the manuscript record, and check for the action link "View Attachments". If this link does not appear, there are no attachment files to be viewed.]

While revising your submission, please upload your figure files to the Preflight Analysis and Conversion Engine

(PACE) digital diagnostic tool, https://pacev2.apexcovantage.com/. PACE helps ensure that figures meet PLOS requirements. To use PACE, you must first register as a user. Registration is free. Then, login and navigate to the UPLOAD tab, where you will find detailed instructions on how to use the tool. If you encounter any issues or have any questions when using PACE, please email us at figures@plos.org. Please note that Supporting Information files do not need this step.

Kind regards,

Annette Christopoulos
Staff EO
PLOS ONE

Dewi Anggraini <dewi.anggraini@ulm.ac.id> Wed, Nov 20, 2019 at 8:53 PM
To: PLOS ONE <plosone@plos.org>

Dear Sir/Madam,

I am very pleased to review the revision of this paper in the future.

Thank you for selecting me to be one of the reviewers.

Kind regards,
Dewi

Lecturer
Department of Statistics
Faculty of Mathematics and Natural Sciences
University of Lambung Mangkurat
Banjarbaru, South Kalimantan, Indonesia

[Quoted text hidden]

Recommendation for a manuscript no PONE-D-19-27564: Regional Disparities in Antenatal Care Utilization in Indonesia

Overall:

Although this study does not demonstrate the advance in the field, the manuscript has been identified as original study with 16% similarity index. The authors have used large and sufficient amount of secondary data that can be accessed online but with registration and permission only through the link: https://dhsprogram.com/data/available-datasets.cfm. Overall, the authors have summarized the main research question and key findings. Authors have also identified other literature on the topic and explain how the study relates to this previously published research. However, the authors should put more explanation on the rationale and significance of this study, particularly in the introduction. The figures and tables are clear, readable, and support the findings. There are only some captions and labels need further clarifications. The presentation of figures and tables are appropriate for the type of data being presented. There is no experiments or interventions used in this study since the authors collected the data from the 2017 Indonesian Demographic Data Survey (IDHS) that can be access online subject to registration and permission to use the data. The authors have used enough qualitative data to draw a conclusion and addressed possible limitations of the research. The process of collecting data, selecting variables of the study, and analyzing the data still needs further details to allow other researchers to fully replicate or recreate the analysis and validate the study. The authors have followed best practices for reporting and conformed to ethical guidelines. The authors have used one or more of the highly qualified native English speaking editors at American Journal Experts (AJE) to edit the manuscript for proper English language, grammar, punctuation, spelling, and overall style. The results of this study support the conclusions even though some of them could not be justified directly from the results. The authors briefly mentioned about the limitation of this study. The statistical analysis was adequate but needs more details on the assumption that we need to meet for each single type of statistical test to ensure the validity of the results. The summary data presented in the manuscript have provided enough evidence for the author's conclusions although the necessary data points can only be accessed online with registration and permission.

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In the last sentence: This study aims to analyze interregional disparities **in ANC utilization with ≥ 4 visits** during pregnancy in Indonesia.

Methods:

This research has used secondary data derived from IDHS 2017. The data are accessible online through https://dhsprogram.com/data/available-datasets.cfm but with registration and permission. You have missed to mention about the use of principal component analysis and chi-square in your analysis here.

Results:

1st sentence: …….in the use of ANC with **≥ 4 visits** compared to……..

Conclusion:

……. in ANC utilization **with ≥ 4 visits** between …..

There is inconsistency in the number of variables cause disparity in the ANC utilization ≥ 4 visits in Indonesia mentioned in the conclusion (abstract) (6) and the conclusion (main manuscript) (10).

Keywords:
Antenatal care utilization, contributing factors, regional disparity, Indonesia.

Main Manuscript

Introduction

The introduction does not provide sufficient background that puts the manuscript into context. This is because:

1. Some information between paragraphs is not well-linkage so that it is difficult to understand the rationale, purpose, and significance of the study.
2. Lack of data and review of key literature regarding disparity in the ANC utilization to show what the problem with disparity, why it is important to be addressed, and controversies or disagreements in the field.

These result in unclear statement of the overall aim and significance of the study.

Below some disconnections found in every paragraph in the Introduction:

1st paragraph:

You can simply said:

"In the 2015-2019 National Medium-Term Development Plan, Indonesia has targeted to increase the distribution equity and quality of health services by the end of 2019". Then you can combined and continue this sentence with the second paragraph like: "The target can be determined by three indicators, namely …..".

2nd paragraph:

You mentioned about three indictors to increase the distribution equity and quality of health services and there is no linkage information to the use of ANC with ≥ 4 visits.

3rd paragraph:

You mentioned about target of mortality rates with no further linkage to the effort of increasing the distribution equity and quality of health services.

4th paragraph:

You mentioned about disparities in maternal deaths among districts/cities in Indonesia which the highest is in Eastern Indonesia and the risk factors that most influenced maternal mortality, including low coverage of four pregnancy visits. This is good information and try to connect it with what you have written in the 5th paragraph.

5th paragraph:

You have introduced ANC as the main strategy for reducing maternal mortality and morbidity but please check the structure of the 1st sentence. I would recommend if you can write it as "Antenatal care (ANC) is the main strategy to decrease maternal morbidity and mortality".

You also mentioned a good information about the increase use of ANC and its variation (disparity) among populations groups due to geographical, demographic, socioeconomic, and cultural differences that result in the decrease of access to service as well as its quality and affordability.

6th paragraph:

You mentioned some statistics showing the increase proportion of ANC utilization (1st and 4th visits) and identified that the quality of ANC services needs further improvement. After that, however, you put some information that does not link with what you have said in the previous 1st and 2nd lines. The information perhaps can be used in Discussion rather than in the Introduction.

7th paragraph:

The aim of study was to analyze disparity in the utilization of ANC with ≥ 4 visits to provide clear directions for the Health Ministry to complete regional priority data in an effort to reduce maternal mortality. However, it is not clear enough on how you could provide directions to the Ministry, what regional priority data is for and the connection with the reduction of maternal mortality. Please further explain them in the discussion so that you can answer your research question.

You have mentioned in the 6th paragraph that the quality of ANC services needs to be improved. How this relates to the utilization of ANC with ≥ 4 visits?

Methods

Data Source

Since you are using secondary data from IDHS which can be accessed online with registration/permission, there is no need to explain too much detail on the sampling design of the survey, except you did the "real" survey. The sampling design has been perhaps explained in details in reference no 13, so you do not need to repeat that again here. In this part, you should provide enough detail on how (the procedures) you get the data from IDHS, what variables that you use (dependent and independent variables), how to select them, and how many data you get from the IDHS to answer your research question to allow suitably skilled investigators to fully replicate your study. Please mention here that you have obtained the permission to use the data for the purpose of the study.

Procedure

Since you are using secondary data from IDHS and not conducting the "real" survey, there is no need to explain the ethical clearance of conducting the survey.

I do not think this sub section "Procedure" is needed since you are not dealing with primary data or experimental study.

Data Analysis

The explanation about variables used in the study can be placed under "**Data Source**" as I mentioned earlier.

In this section, you should you provide sufficient information on how you analyze the data. This includes how the principal component analysis was used to calculate the score; how to arrange the national wealth quintiles; how to select variables that related to the frequency of ANC utilization using the chi-square test, including the assumption that we need to meet; and how to

determine disparity using binary logistic regression to allow suitably skilled investigators to fully replicate your study.

I could not see the use of chi-square test and principal component analysis in your results.

Results

1st paragraph:

Fig. 1 caption: "Distribution of ANC utilization percentage with ≥ 4 visits across 34 provinces in Indonesia".

Legend: "Antenatal care with ≥ 4 visits"

I would suggest that the 1st sentence will be written as following:

"According to Fig. 1, the eastern part of Indonesia (Maluku and Papua regions) has the lowest percentage of ANC utilization with ≥ 4 visits (< 75.64%). This was higher in the western part of Indonesia (Sumatera), recorded from 75.65% to 92.74% and best centered in the central part of Indonesia (Java-Bali), > 92.74%".

2nd paragraph:

The first sentence: The statistical description, calculated in counts (%), of female ……

The second sentence: Table 1 shows that there are statistically significant socio-demographic differences between regions. Also, please mention here or in the "**Methods**" which category of variables become references.

You should also explain why the 34 provinces are divided into 7 regions in the "**Methods**".

Table 1:

In the 9th column, please change the label "All" to "Total".

In the last column, please put "p-value" instead of "P" which in Statistics can be meant proportion. Also, provide information of what test statistics used for testing the differences among regions and the testing criteria in "**Methods**".

3rd and 4th paragraphs:

Please combine them into one paragraph.

5th paragraph:

The third sentence: Typo "**Table 3**" should be "**Table 2**"; "…….and shows no differences……"

6th paragraph:

The first sentence: "…….differences in the ANC utilization with ≥ 4 visits is ……."

The second sentence: "……..Nusa Tenggara region were 4.365 times more likely to have ≥ 4 ANC visits compared….."

7th paragraph:

Combine this paragraph with the 6th paragraph.

8th paragraph:

Please be aware of the use of articles "a".

The fourth sentence: "……has a lower tendency to utilize ANC ≥ 4 visits than…..".

Table 2: I suggest the label for column "≥ 4 ANC visits" to be "ANC utilization with ≥ 4 visits".

9th paragraph:

Please combine the 1st and 2nd sentences together, so that "Table 2 indicates that women who have a husband/partner have 2.107 times higher chance of utilizing ANC ≥ 4 visits compared to women who do not have a husband/partner (OR 2.107; 95%CI 1.674-2.651)".

Please be aware of the use of articles "a" in the 9th and 11th paragraphs.

Please combine the 9th to the 13th paragraph into one concise summary.

Discussion

Please combine some of paragraphs that contain less than 3 sentences or add more sentences to make a proper paragraph.

Please explain the 3rd paragraph using simpler language.

Conclusion

Here, you have mentioned 10 variables that contributed to disparities in ANC utilization among women in Indonesia to make ≥ 4 visits. This number is inconsistent with what you have written in the conclusion of the abstract. Some of the variables, such as “not being able to read”, “not being exposed to the media”, “never using the Internet”, “not knowing the signs of danger related to pregnancy”, and “a belief in traditional birth attendants”, may need more explanation and justification in the results to avoid overreach conclusion.

PLOS ONE

Regional Disparities in Antenatal Care Utilization in Indonesia

--Manuscript Draft--

Manuscript Number:	PONE-D-19-27564
Article Type:	Research Article
Full Title:	Regional Disparities in Antenatal Care Utilization in Indonesia
Short Title:	Regional Disparities in Antenatal Care Utilization
Corresponding Author:	Ratna Dwi Wulandari, Dr Universitas Airlangga Surabaya, Jawa Timur INDONESIA
Keywords:	antenatal care, the barrier of utilization, mother health
Abstract:	Introduction: The main strategy for decreasing maternal morbidity and mortality has been antenatal care (ANC). ANC aims to monitor and maintain the health and safety of the mother and the fetus, detect all complications of pregnancy and take the necessary actions, respond to complaints, prepare for birth, and promote a healthy lifestyle. This study aims to analyze interregional disparities in ≥4 ANC visits during pregnancy in Indonesia. Methods: Data was acquired from the 2017 Indonesian Demographic and Health Survey (IDHS). The unit of analysis was women aged 15-49 years old, and a sample of 15,351 women was obtained. In addition to ANC as the dependent variable, the other variables analyzed in this study were place of residence, age, husband/partner, education, parity, wealth status, and health insurance. For the final analysis, binary logistic regression was used to determine disparity. Results: With the Papua region as a reference, all regions showed a gap except for the Maluku region, which was not significantly different in the use of ANC compared to the Papua region. Women in the Nusa Tenggara have 4.365 times the chance of making ≥4 ANC visits compared to those in the Papua region. Women in Java-Bali have 3,607 times the chance of making ≥4 ANC visits compared to women in the Papua region. Women in Sumatra have 1,370 times the chance of making ≥4 ANC visits compared to women in the Papua region. Women in Kalimantan have 2.232 times the chance of making ≥4 ANC visits compared to women in the Papua region. Women in Sulawesi have 1,980 times more chance of making ≥4 ANC visits compared to women in the Papua region. In addition to the region category, other variables that contributed to the predictor were age, husband/partner, education, parity, wealth and insurance. Conclusion: There were disparities in ANC utilization between the various regions of Indonesia.
Order of Authors:	Agung Dwi Laksono
	Rukmini Rukmini
	Ratna Dwi Wulandari, Dr
Additional Information:	
Question	**Response**
Financial Disclosure Enter a financial disclosure statement that describes the sources of funding for the work included in this submission. Review the submission guidelines for detailed requirements. View published research articles from *PLOS ONE* for specific examples. This statement is required for submission	The author(s) received no specific funding for this work.

and **will appear in the published article** if the submission is accepted. Please make sure it is accurate. **Unfunded studies** Enter: *The author(s) received no specific funding for this work.* **Funded studies** Enter a statement with the following details: • Initials of the authors who received each award • Grant numbers awarded to each author • The full name of each funder • URL of each funder website • Did the sponsors or funders play any role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript? • **NO** - Include this sentence at the end of your statement: *The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.* • **YES** - Specify the role(s) played. * typeset	
Competing Interests Use the instructions below to enter a competing interest statement for this submission. On behalf of all authors, disclose any competing interests that could be perceived to bias this work—acknowledging all financial support and any other relevant financial or non-financial competing interests. This statement **will appear in the published article** if the submission is accepted. Please make sure it is accurate. View published research articles from *PLOS ONE* for specific examples.	The authors have declared that no competing interests exist.

NO authors have competing interests Enter: *The authors have declared that no competing interests exist.* **Authors with competing interests** Enter competing interest details beginning with this statement: *I have read the journal's policy and the authors of this manuscript have the following competing interests: [insert competing interests here]* * typeset	
Ethics Statement Enter an ethics statement for this submission. This statement is required if the study involved: • Human participants • Human specimens or tissue • Vertebrate animals or cephalopods • Vertebrate embryos or tissues • Field research Write "N/A" if the submission does not require an ethics statement. General guidance is provided below. Consult the submission guidelines for detailed instructions. **Make sure that all information entered here is included in the Methods section of the manuscript.**	Ethical clearance has been obtained in the 2017 IDHS from the National Ethics Committee. The respondents' identities have all been deleted from the dataset. Respondents have provided written approval for their involvement in the study. Through the website: https://dhsprogram.com/data/new-user-registration.cfm researchers have obtained permission to use data for the purposes of this study.

Format for specific study types **Human Subject Research (involving human participants and/or tissue)** • Give the name of the institutional review board or ethics committee that approved the study • Include the approval number and/or a statement indicating approval of this research • Indicate the form of consent obtained (written/oral) or the reason that consent was not obtained (e.g. the data were analyzed anonymously) **Animal Research (involving vertebrate animals, embryos or tissues)** • Provide the name of the Institutional Animal Care and Use Committee (IACUC) or other relevant ethics board that reviewed the study protocol, and indicate whether they approved this research or granted a formal waiver of ethical approval • Include an approval number if one was obtained • If the study involved *non-human primates*, add *additional details* about animal welfare and steps taken to ameliorate suffering • If anesthesia, euthanasia, or any kind of animal sacrifice is part of the study, include briefly which substances and/or methods were applied **Field Research** Include the following details if this study involves the collection of plant, animal, or other materials from a natural setting: • Field permit number • Name of the institution or relevant body that granted permission	
Data Availability Authors are required to make all data underlying the findings described fully available, without restriction, and from the time of publication. PLOS allows rare exceptions to address legal and ethical concerns. See the PLOS Data Policy and FAQ for detailed information.	Yes - all data are fully available without restriction

A Data Availability Statement describing where the data can be found is required at submission. Your answers to this question constitute the Data Availability Statement and **will be published in the article**, if accepted. **Important:** Stating 'data available on request from the author' is not sufficient. If your data are only available upon request, select 'No' for the first question and explain your exceptional situation in the text box. Do the authors confirm that all data underlying the findings described in their manuscript are fully available without restriction?	
Describe where the data may be found in full sentences. If you are copying our sample text, replace any instances of XXX with the appropriate details. • If the data are **held or will be held in a public repository**, include URLs, accession numbers or DOIs. If this information will only be available after acceptance, indicate this by ticking the box below. For example: *All XXX files are available from the XXX database (accession number(s) XXX, XXX.*). • If the data are all contained **within the manuscript and/or Supporting Information files**, enter the following: *All relevant data are within the manuscript and its Supporting Information files.* • If neither of these applies but you are able to provide **details of access elsewhere**, with or without limitations, please do so. For example: *Data cannot be shared publicly because of [XXX]. Data are available from the XXX Institutional Data Access / Ethics Committee (contact via XXX) for researchers who meet the criteria for access to confidential data.* *The data underlying the results presented in the study are available from (include the name of the third party*	Data is available at https://dhsprogram.com/data/new-user-registration.cfm, but requires permission to get the dataset

and contact information or URL). • This text is appropriate if the data are owned by a third party and authors do not have permission to share the data. * typeset	
Additional data availability information:	Tick here if the URLs/accession numbers/DOIs will be available only after acceptance of the manuscript for publication so that we can ensure their inclusion before publication.

Regional Disparities of Antenatal Care Utilization in Indonesia

***Agung Dwi Laksono[1], Rukmini Rukmini[1], Ratna Dwi Wulandari[2]**

[1] National Institute of Health Research and Development, The Ministry of Health, The Republic of Indonesia.

[2]Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia. Campus C Mulyorejo Surabaya, Indonesia

***Corresponding Author**

Ratna Dwi Wulandari

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Abstract

Introduction: The main strategy for decreasing maternal morbidity and mortality has been antenatal care (ANC). ANC aims to monitor and maintain the health and safety of the mother and the fetus, detect all complications of pregnancy and take the necessary actions, respond to complaints, prepare for birth, and promote a healthy lifestyle. This study aims to analyze interregional disparities in ≥4 ANC visits during pregnancy in Indonesia.

Methods: Data was acquired from the 2017 Indonesian Demographic and Health Survey (IDHS). The unit of analysis was women aged 15-49 years old, and a sample of 15,351 women was obtained. In addition to ANC as the dependent variable, the other variables analyzed in this study

were place of residence, age, husband/partner, education, parity, wealth status, and health insurance. For the final analysis, binary logistic regression was used to determine disparity.

Results: With the Papua region as a reference, all regions showed a gap except for the Maluku region, which was not significantly different in the use of ANC compared to the Papua region. Women in the Nusa Tenggara have 4.365 times the chance of making ≥4 ANC visits compared to those in the Papua region. Women in Java-Bali have 3,607 times the chance of making ≥4 ANC visits compared to women in the Papua region. Women in Sumatra have 1,370 times the chance of making ≥4 ANC visits compared to women in the Papua region. Women in Kalimantan have 2.232 times the chance of making ≥4 ANC visits compared to women in the Papua region. Women in Sulawesi have 1,980 times more chance of making ≥4 ANC visits compared to women in the Papua region. In addition to the region category, other variables that contributed to the predictor were age, husband/partner, education, parity, wealth and insurance.

Conclusion: There were disparities in ANC utilization between the various regions of Indonesia.

Keywords: antenatal care, the barrier of utilization, mother health

Introduction

Indonesia has entered the final year of the 2015-2019 National Medium-Term Development Plan. In the 2015-2019 National Medium-Term Development Plan, 4 main health targets were established, which must be achieved by 2019: 1) Improve the health and nutritional status of the community; 2) Improve the control of communicable and noncommunicable diseases; 3) Increase the equity and quality of health services; and 4) Increase financial protection, availability, distribution, quality of medicines and health resources [1].

In health development, the target of increasing equal distribution and quality of health services is determined by three indicators, namely, the number of subdistricts that have at least one accredited Puskesmas (Health Center), which is 5,600; the number of regencies/cities that have at least one nationally accredited hospital, which is 481; and the percentage of regencies/cities that have up to 80% completed basic immunizations in infants, which is as much as 95%. Based on the Ministry of Health's report, this target has been achieved; in 2018, the target number of subdistricts that had at least one accredited Health Center of the 4,900 subdistricts has been as many as 5,385 subdistricts (109.9%) or approximately 7,518 Health Centers. This achievement exceeded the established target because several regencies/cities used the Regional Revenue and Expenditure Budget purely for the accreditation process and did not use resources from the Non-Physical Allocation Fund. In 2018, the number of regencies/cities that had at least one nationally accredited hospital was 440 (101.4%) of the target of 434. The immunization target was not achieved; the 2018 data shows that complete basic immunization coverage for children aged 12-23 months in Indonesia was 57.9%, incomplete coverage was 32.9% and not immunized was 9.2% [2].

With regard to the target of improving the community's health and nutrition status, several achievement targets have been set, namely, a maternal mortality rate (MMR) of 306/100,000 live

births, an infant mortality rate (IMR) of24/1,000 live births, a prevalence of malnutrition in children under five of 17/100,000, and a prevalence of stunting in children under two years of 28/100,000. The MMR is currently reported to have decreased by 346 deaths to 305 maternal deaths per 100,000 live births but has not reached the MDG target in 2015 of 102/100,000 live births [3]. On the other hand, Indonesia must strive to be higher on the SDG's target by reducing the MMR to below 70/100,000 live births, reducing neonatal mortality to 12/1000 live births and reducing the toddler death rate to 25/1000 live births [4]. The MMR in Indonesia is the highest compared to other ASEAN countries and is 9 times that of Malaysia, 5 times that of Vietnam and almost 2 times that of Cambodia. Based on the WHO reports, the estimated MMR in developed countries is 12/100,000 live births, while in developing countries, it is 239/100,000 live births [5-6].

The results of research in Indonesia that used 2013 data showed disparities in maternal deaths among districts/cities in Indonesia, with the highest risk of maternal deaths occurring in Eastern Indonesia. The risk factors that most influenced maternal mortality were population density with OR 0.283 (95% CI 0.185-0.430) and delivery by health workers with OR 1.745 (95% CI 1.081-2.815). The risk of maternal death is high in districts/cities with low coverage of fourth pregnancy visits, low coverage of delivery by health workers, low coverage of postpartum visits, high average number of children, low average length of schooling for women of childbearing age, and high poverty [7].

The main strategy is to decrease maternal morbidity and mortality with antenatal care (ANC). ANC aims to monitor and maintain the health and safety of the mother and the fetus, detect all complications of pregnancy and take the necessary actions, respond to complaints, prepare for birth, and promote a healthy lifestyle. ANC visits are very important to detect and prevent

unwanted occurrences that arise during pregnancy [8]. In developing countries, there has been an increase in the utilization of maternal health services, but it still varies among population groups. Disparities can occur due to geographical, demographic, socioeconomic, and cultural differences. Gaps that occur result in decreased access to services, service quality, and service affordability [9-10].

In 2018, there was an increase in the proportion of ANC visits for women aged 10-54 years, i.e., first visit by 96.1% compared to 95.2% in 2013, while ANC fourth visits in 2018 amounted to 74.1% compared to 70.0% in 2013; the coverage of ANC fourth visits is still below the target that was established in the 2017 Strategic Plan, which is 76.0% [11]. However, the quality of services to ensure early diagnosis and appropriate care for pregnant women still needs to be improved. Midwives are spearheading pregnancy checks by identifying complications or symptoms of complications, assisting in labor and conducting childbirth examinations. If there are signs of complications that cannot be treated, the midwife must make a referral to a health facility that provides Basic Emergency Neonatal Obstetric Services to obtain further treatment [12]. Data from the Ministry of Health in 2018 stated that the majority (62.7%) of deliveries were assisted by midwives and were carried out in independent midwife practices (29%), although there were still many carried out at home (16%) [11].

This study was conducted to analyze interregional disparities in the utilization of ≥4 ANC visits during pregnancy in women aged 15-49 years who gave birth in the last five years in Indonesia. This study is important because it can provide clear directions for the Ministry of Health to complete regional priority data in an effort to reduce maternal mortality.

Methods

Data Source

This study analyzed data from the 2017 Indonesian Demographic Data Survey (IDHS). The IDHS was part of the International Demographic and Health Survey (DHS) program conducted by the Inner City Fund (ICF).

The 2017 IDHS sampling design was designed to present national and provincial level estimates. The 2017 IDHS sample includes 1,970 census blocks covering urban and rural areas. The census blocks were expected to obtain a household sample of 49,250 respondents. From all household samples, it was expected that 59,100 female respondents of childbearing age (aged 15-49 years) could be obtained. The 2017 IDHS sample framework uses the master census block sample from the 2010 Population Census. The household selection sample framework uses the list of ordinary households that have been updated from the selected census block [13]. Women 15-49 years of age who had given birth in the last 5 years were the unit of analysis in this study. A sample of 15,351 women was obtained.

The sampling design used in the 2017 IDHS is a two-stage stratified sampling method. Stage 1 involved selecting a number of systematic census blocks in a systematic proportional to size (PPS) measure with the size of the households as a result of the 2010 Population Census listing. Stage 2 consisted of systematically selecting 25 ordinary households in each census block from the result of updating the households in each of the census blocks [13].

Procedure

Ethical clearance was obtained in the 2017 IDHS from the National Ethics Committee. The respondents' identities have all been deleted from the dataset. Respondents provided written

approval for their involvement in the study. Researchers have obtained permission to use the data for the purposes of this study through the following website: https://dhsprogram.com/data/new-user-registration.cfm.

Data Analysis

The Ministry of Health of the Republic of Indonesia recommends that the ANC during pregnancy be performed at least 4 times, namely, 1 time in the first trimester, 1 time in the second trimester, and 2 times in the third trimester [13]. Other variables analyzed as independent variables are the place of residence, age, husband/partner, education level, parity, wealth status, and health insurance. The place of residence was divided into urban or rural residential areas. The urban-rural designation follows the criteria issued by the Central Statistics Agency. Wealth status was based on the wealth quintile owned by a household. Households were scored based on the number and type of items they have, from televisions to bicycles or cars, and housing characteristics, such as drinking water sources, toilet facilities, and main building materials for the floor of the house. This score was calculated using principal component analysis. National wealth quintiles were arranged based on household scores for each person in the household and then divided by the distribution into the same five categories, with each accounting for 20% of the population [13].

Because all of the variables are categorical, the chi-square test was used to select variables related to the frequency of ANC utilization during pregnancy. Because of the nature of the dependent variable, binary logistic regression was used for the final test to determine disparity.

Results

Fig 1. Distribution of ≥4 ANC visits by province in Indonesia. Fig 1 is a description of the distribution of ≥4 ANC visits in 34 provinces in Indonesia. The eastern part of Indonesia (Maluku and Papua regions) has the lowest distribution of ≥4 ANC visits. The westernmost area (part of the Sumatra region) has a distribution of ≥4 ANC visits at one level above. The distribution of ≥4 ANC visits is best centered on the central region of the Java-Bali region.

The statistical description of female respondents aged 15-49 years who gave birth in the last five years in Indonesia is presented in Table 1. Table 1 shows that there are statistically significant differences between regions. Each region was dominated by the use of ANC, which had ≥4 visits.

Table 1 indicates that the Java-Bali and Kalimantan regions are more dominated by urban areas, while the remaining regions are dominated by rural areas. In all regions, it was also seen that the dominant age categories of women were 25-29 years and 30-34 years. Table 1 shows that all regions are dominated by women who have a husband/partner, have a secondary education level, and have 2-4 parity.

Table 1 shows that almost all regions are dominated by women who have the wealth status of 'poorer' or 'poorest', except in the Java-Bali region, which is dominated by women with the 'richest' wealth status. Most women aged 15-49 years who had delivered a baby in their last five years in Indonesia were covered by health insurance in all regions.

Tabel 1. Socio-Demographic of Respondents (n=15,351)

Variables	Region							All	P
	Sumatera	Java-Bali	Nusa Tenggara	Kalimantan	Sulawesi	Maluku Islands	Papua		
ANC									0.000***
• <4 (ref.)	606 (15.07%)	261 (5.36%)	120 (9.30%)	154 (10.82%)	310 (13.53%)	248 (24.17%)	121 (27.94%)	1820 (11.86%)	
• ≥4	3416 (84.93%)	4605 (94.64%)	1170 (90.70%)	1269 (89.18%)	1981 (86.47%)	778 (75.83%)	312 (72.06%)	13531 (88.14%)	
Place of Residence									0.000***
• Urban	1807 (44.93%)	3312 (68.06%)	384 (29.77%)	738 (51.86%)	841 (36.71%)	380 (37.04%)	106 (24.48%)	7568 (49.30%)	
• Rural (ref.)	2215 (55.07%)	1554 (31.94%)	906 (70.23%)	685 (48.14%)	1450 (63.29%)	646 (62.96%)	327 (75.52%)	7783 (50.70%)	
Age group of respondents									0.000***
• 15-19	96 (2.39%)	102 (2.10%)	32 (2.48%)	46 (3.23%)	75 (3.27%)	51 (4.97%)	14 (3.23%)	416 (2.71%)	
• 20-24	544 (13.53%)	791 (16.26%)	199 (15.43%)	231 (16.23%)	420 (18.33%)	154 (15.01%)	75 (17.32%)	2414 (15.73%)	
• 25-29	1005 (24.99%)	1222 (25.11%)	317 (24.57%)	390 (27.41%)	555 (24.23%)	239 (23.29%)	119 (27.48%)	3847 (25.06%)	
• 30-34	1146 (28.49%)	1226 (25.20%)	328 (25.43%)	366 (25.72%)	534 (23.31%)	260 (25.34%)	103 (23.79%)	3963 (25.82%)	
• 35-39	829 (20.61%)	1021 (20.98%)	254 (19.69%)	241 (16.94%)	429 (18.73%)	199 (19.40%)	83 (19.17%)	3056 (19.91%)	
• 40-44	340 (8.45%)	419 (8.61%)	127 (9.84%)	115 (8.08%)	233 (10.17%)	93 (9.06%)	30 (6.93%)	1357 (8.84%)	
• 45-49 (ref.)	62 (1.54%)	85 (1.75%)	33 (2.56%)2	34 (2.39%)	45 (1.96%)	30 (2.93%)	9 (2.08%)	298 (1.94%)	
Have a husband/partner									0.000***
• No (ref.)	126 (3.13%)	135 (2.77%)	74 (5.74%)	44 (3.09%)	71 (3.10%)	33 (3.22%)	25 (5.77%)	508 (3.31%)	
• Yes	3896 (96.87%)	4731 (97.23%)	1216 (94.26%)	1379 (96.91%)	2220 (96.90%)	993 (96.78%)	408 (94.23%)	14843 (96.69%)	
Education Level									0.000***
• No education (ref.)	38 (0.94%)	21 (0.43%)	56 (4.34%)	14 (0.98%)	36 (1.57%)	8 (0.78%)	31 (7.16%)	204 (1.33%)	
• Primary	888 (2.08%)	1185 (24.35%)	439 (34.03%)	404 (28.39%)	630 (27.50%)	224 (21.83%)	89 (20.55%)	3859 (24.14%)	
• Secondary	2297 (57.11%)	2979 (61.22%)	594 (46.05%)	795 (55.87%)	1156 (50.46%)	578 (56.34%)	229 (52.89%)	8628 (56.20%)	
• Higher	799 (19.87%)	681 (14.00%)	201 (15.58%)	210 (14.76%)	469 (20.47%)	216 (21.05%)	84 (19.40%)	2660 (17.33%)	
Parity									0.000***
• < 2	1161 (28.87%)	1758 (36.13%)	370 (28.68%)	401 (28.18%)	694 (30.29%)	267 (26.02%)	104 (24.02%)	4755 (30.98%)	
• 2 - 4	2572 (63.95%)	2949 (60.60%)	757 (58.68%)	936 (65.78%)	1362 (59.45%)	588 (57.31%)	243 (56.12%)	9407 (61.28%)	
• > 4 (ref.)	289 (7.19%)	159 (3.27%)	163 (12.64%)	86 (6.04%)	235 (10.26%)	171 (16.67%)	86 (19.86%)	1189 (7.75%)	
Wealth status									0.000***
• Poorest (ref.)	871 (21.66%)	474 (9.74%)	783 (60.70%)	285 (20.03%)	858 (37.45%)	576 (56.14%)	226 (52.19%)	4073 (25.53%)	
• Poorer	876 (21.78%)	805 (16.54%)	244 (18.91%)	317 (22.28%)	517 (22.57%)	193 (18.81%)	79 (18.24%)	3031 (19.74%)	
• Midle	857 (21.31%)	1050 (21.58%)	118 (9.15%)	342 (24.03%)	351 (15.32%)	117(11.40%)	55 (12.70%)	2890 (18.83%)	
• Richer	752 (18.70%)	1259 (25.87%)	77 (5.97%)	254 (17.85%)	272 (11.87%)	103 (10.04%)	43 (9.93%)	2760 (17.98%)	
• Richest	666 (16.56%)	1278 (26.26%)	68 (5.27%)	225 (15.81%)	293 (12.79%)	37 (3.61%)	30 (6.93%)	2597 (16.92%)	
Covered by health insurance									0.000***
• No (ref.)	1455 (36.18%)	1961 (40.30%)	499 (38.68%)	630 (44.27%)	712 (31.08%)	482 (46.98%)	100 (23.09%)	5839 (38.04%)	
• Yes	2567 (63.82%)	2905 (59.70%)	791 (61.32%)	793 (55.73%)	1579 (68.92%)	544 (53.02%)	333 (76.91%)	9512 (61.96%)	

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2 shows the results of the binary logistic regression test, which shows disparities between the regions in the use of ANC in Indonesia. At this stage, <4 ANC visits during pregnancy was used as a reference. Table 3 reveals that all regions show difference compared to the Papua region as a reference, except the Maluku region, which is not significant and shows differences in the use of ANC compared to the Papua region.

Table 2 shows that the largest difference in the utilization of ≥4 ANC visits is between the Nusa Tenggara and Papua regions. Women in the Nusa Tenggara region have 4.365 times more than ≥4 ANC visits compared to women in the Papua region (OR 4.365; 95% CI 3.229-5.899). Women in the Java-Bali region were 3.607 times more likely to make ≥4 ANC visits than women in the Papua region (OR 3.607; 95% CI 2.741-4.746).

Table 2 also shows disparities between the Sumatra, Kalimantan and Sulawesi regions compared to the Papua region. Women in the Sumatra region have 1.370 times the chance of making ≥4 ANC visits compared to women in the Papua region (OR 1.370; 95% CI 1.066-1.761). Women in the Kalimantan region had 2.232 times the chance of making ≥4 ANC visits compared to women in the Papua region (OR 2.232; 95% CI 1.664-2.994). Women in the Sulawesi region had 1,980 times the chance of making ≥4 ANC visits compared to women in the Papua region (OR 1.980; 95% CI 1.523-2.574).

In addition to the region category, other variables found to contribute to the predictor are age group, husband/partner, education level, parity, wealth status, and health insurance. Table 2 shows that women in the age group of 15-19 years had a 0.336 times higher chance of making ≥4 ANC visits compared to women in the age group of 45-49 years (OR 0.336; 95% CI 0.218-0.519). The age group of 20-24 years had 0.675 times the chance of making ≥4 ANC visits compared to

women in the age group of 45-49 years (OR 0.675; 95% CI 0.465-0.979). This shows that the youngest age group has a lower possibility of ≥4 ANC visits than the oldest age group.

Table 2. Binary Logistic Regression of ANC Utilization (n=15,351)

Predictor	≥4 ANC visits			
	P	OR	Lower Bound	Upper Bound
Region: Sumatera	0.014*	1.370	1.066	1.761
Region: Java-Bali	0.000***	3.607	2.741	4.746
Region: Nusa Tenggara	0.000***	4.365	3.229	5.899
Region: Kalimantan	0.000***	2.232	1.664	2.994
Region: Sulawesi	0.000***	1.980	1.523	2.574
Region: Maluku Islands	0.171	1.213	0.920	1.600
Place of Residence: Urban	0.584	0.967	0.856	1.092
Age group of respondents: 15-19	0.000***	0.336	0.218	0.519
Age group of respondents: 20-24	0.038*	0.675	0.465	0.979
Age group of respondents: 25-29	0.691	0.930	0.652	1.328
Age group of respondents: 30-34	0.763	1.055	0.744	1.496
Age group of respondents: 35-39	0.441	1.145	0.811	1.618
Age group of respondents: 40-44	0.841	1.037	0.725	1.485
Have a husband/partner: Yes	0.000***	2.107	1.674	2.651
Education Level: Primary	0.000***	2.527	1.838	3.474
Education Level: Secondary	0.000***	3.882	2.815	5.353
Education Level: Higher	0.000***	3.669	2.559	5.259
Parity: < 2	0.000***	3.580	2.857	4.485
Parity: 2 - 4	0.000***	2.519	2.121	2.992
Wealth status: Poorer	0.000***	1.674	1.449	1.933
Wealth status: Midle	0.000***	2.056	1.739	2.431
Wealth status: Richer	0.000***	2.690	2.204	3.284
Wealth status: Richest	0.000***	3.596	2.813	4.596
Covered by health insurance: Yes	0.000***	1.485	1.334	1.653

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2 indicates that women who have a husband/partner have a better chance of making ≥4 ANC visits than those without a husband/partner. More specifically, women who have a husband/partner have a 2.107 times higher chance of making ≥4 ANC visits compared to women who do not have a husband/partner (OR 2.107; 95% CI 1.674-2.651).

Table 2 shows that women with higher levels of education have a better chance of making ≥4 ANC visits than those without higher levels of education. Women with primary education had 2.527 times the chance of making ≥4 ANC visits compared to women with no education (OR 2.527; 95% CI 1.838-3.474). Women with secondary education were 3.882 times more likely to make ≥4 ANC visits compared to women with no education (OR 3.882; 95% CI 2.815-5.353). Women with a higher level of education had 3.669 times the chance of making ≥4 ANC visits than women with no education (OR 3.669; 95% CI 2.559-5.259).

Table 2 shows that women with lower parity have a better chance of making ≥4 ANC visits than those who have a parity >4. Women who have a parity <2 have 3.580 times the chance of making ≥4 ANC visits than women who have a parity >4 (OR 3.580; 95% CI 2.857-4.485). Women who had a parity between 2 and 4 had 2.519 times the chance of making ≥4 ANC visits compared to women who had a parity >4 (OR 2.519; 95% CI 2.121-2.992).

Table 2 shows that the higher the wealth status held by a woman, the higher the probability of making ≥4 ANC visits. The richest women had 3.596 times the chance of making ≥4 ANC visits compared to the poorest women (OR 3.596; 95% CI 2.813-4.586).

Table 2 shows that women covered by health insurance had a better chance of making ≥4 ANC visits than those who were not covered. Women who are covered by health insurance have 1.485 times the chance of making ≥4 ANC visits compared to women who are not covered by health insurance (OR 1.485; 95% CI 1.334-1.653).

Discussion

The results showed that disparity between regions in the use of ANC is still ongoing. The disparity is also clearly seen between the eastern and western regions. The results of this analysis are in line with several studies in Indonesia that show that the eastern region lags behind the western region [14-16], especially when compared to the Java-Bali region as the center of government.

Geographically, conditions in eastern Indonesia also show more extreme variability than conditions in the western regions. These conditions make some parts of eastern Indonesia fall in the category of an isolated or remote area [17-18], and some other areas are quite difficult to reach because of the limited means of available roads and public transportation [19].

Qualitatively, some research also shows that in the eastern region, having more health beliefs is a challenge for health workers to strive for better maternal health [20-21]; this not only applies to the community but also applies to the health belief encompassed by health workers because they are an inseparable part of the community itself [22].

The analysis shows that there is no difference between urban and rural areas in ANC utilization in Indonesia. This condition is different from the findings in Nigeria [23], Ethiopia [24], Pakistan [25] and several other countries [26], which found disparities between urban and rural areas.

Age group was found to be a predictor of ANC utilization. The youngest age group has a lower probability of making ≥4 ANC visits. This is likely due to a lack of experience, so knowledge about health risks is lower [27-28]. A study in India that analyzed the relationship between child marriage and the utilization of maternal healthcare services concluded that many challenges were

found; more effort was needed so that child marriage could have a positive impact on the use of maternal healthcare services [29].

The analysis shows that women who have husbands/partners are more likely to use ANC. This is in line with the findings of several studies that have shown the role of a husband/partner in providing support for a woman's healthy lifestyle [30--33]. Some other studies actually encourage a husband to be help improve a woman's health status through actively encouraging a healthier lifestyle [34-35].

The analysis of this study proves that education is one of the determining factors for women in Indonesia to make ≥4 ANC visits. In general, it can be explained that the more educated a person is, the easier it is to receive new health information and understand the dangers or risks of behaviors that have an impact on health [36-38]. Education has also been shown to play a role in one's perception of the quality of health services [39, 40]. Furthermore, improving education is generally accepted as one of the determinants of life expectancy [41].

This study found that parity is a determinant of the use of ANC. The lower the parity, the more likely one is to make ≥4 ANC visits. Parity as one of the determinants of ANC utilization has also been found in several recent studies in several countries [42-44].

In line with the level of education, wealth status was also found to be directly proportional to the likelihood of ≥4 ANC visits. This result is in accordance with several studies that found that wealth status is one of the positive determinants of ANC utilization, namely, in Ethiopia [45], Pakistan [46], Nigeria [47], and Uganda [48]. The higher the wealth status of a woman is, the more likely the woman is to make ≥4 ANC visits.

Women covered by health insurance were found to have higher ANC utilization. Women who did not have health insurance had lower ANC utilization. This finding is in line with the goal

of the National Health Insurance released by the Indonesian government to provide universal access to health care facilities [49, 50]. Social insurance policies to increase public access to health care facilities have also been adopted by other countries. The results of other studies that have evaluated this matter have shown positive results [51-53], although there were still some obstacles encountered in the implementation [54-55].

The disparities found and detected in this study are still limited to a superficial understanding. Researchers suggest that further research be carried out to detect the in-depth causes of disparity.

Conclusions

Based on the results of this study, it can be concluded that there are 10 variables that become a barrier for Indonesian women to make ≥4 ANC visits during pregnancy. The barriers consisted of the following variables: young age, low education, high parity, poverty, not having health insurance, not being able to read, not being exposed to the media, never using the internet, not knowing the signs of danger related to pregnancy, and a belief in traditional birth attendants. Thus, maternal health programs need to address barriers to effective health care utilization.

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Author Contributions

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Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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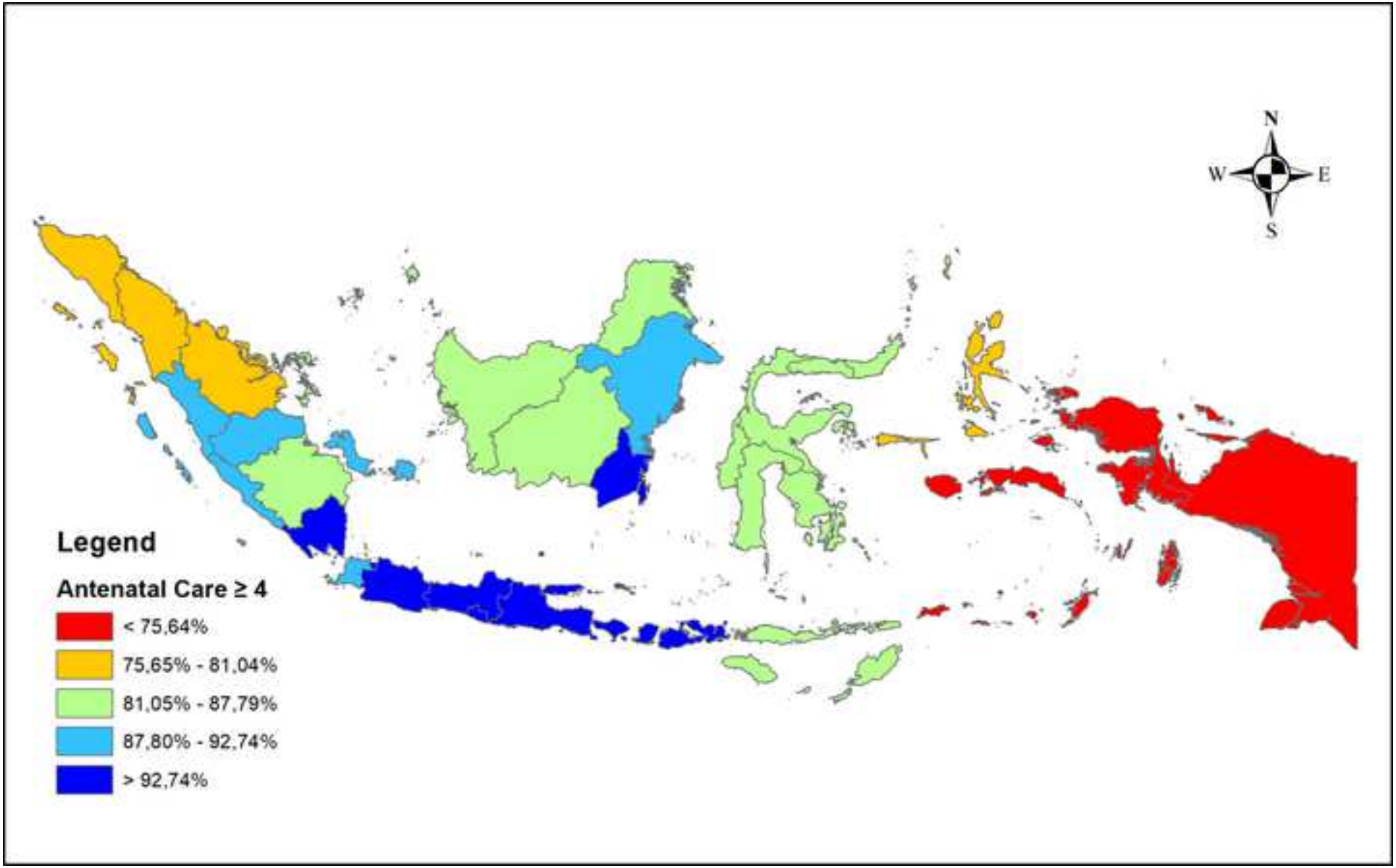

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