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EVERY MOTHER AND NEWBORN COUNTS STUDY

USAID Jalin Project

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ACRONYMS AND ABBREVIATIONS

AM	Arrangement Meeting
ANC	Antenatal Care
BPJS Kesehatan	*Badan Pengelola Jaminan Sosial Kesehatan*
COD	Cause of Death
COPD	Chronic Obstructive Pulmonary Disease
CRC	Capture-recapture
C-section	Caesarean section
DHO	District Health Office
EMNC	Every Mother and Newborn Counts
HIS	Health Information System
Hb	Hemoglobin
IDHS	Indonesian Demographic Health Survey
IDR	Indonesian Rupiah
IMNCI	Integrated Management of Neonatal and Childhood Illness
Immpact	Initiative for maternal mortality program assessment
IUFD	Intra-Uterine Fetal Deaths
Jamkesda	*Jaminan Kesehatan Daerah*
Jampersal	*Jaminan Persalinan*
JHU	Johns Hopkins University
JKN PBI	*Jaminan Kesehatan Nasional Penerima Bantuan Iuran* (National Health Insurance – which the premium is paid by the government)
JKN non-PBI	*Jaminan Kesehatan Nasional non Penerima Bantuan Iuran* (National Health Insurance – *non PBI*)
JKN PBI-APBD	*Jaminan Kesehatan Nasional Penerima Bantuan Iuran – Anggaran Pendapatan Belanja Daerah* (National Health Insurance – which the premium is paid by the local government)
JKN PBI-APBN	*Jaminan Kesehatan Nasional Penerima Bantuan Iuran – Anggaran Pendapatan Belanja Negara* (National Health Insurance – which the premium is paid by the central government)
JKN PBPU	*Jaminan Kesehatan Nasional Peserta Bukan Penerima Upah* (National Health Insurance – self-payment)
JKN PPU	*Jaminan Kesehatan Nasional Peserta Penerima Upah* (National Health Insurance – for civil servant)
Kader	Community Health Volunteer
KTP	*Kartu Tanda Penduduk* (Identification Card)
K1	Antenatal visit in trimester 1
LM	Listing Meeting
MADE-IN/ MADE-FOR (MIMF)	Maternal Death from Informant/Maternal Death Follow-on Review
MPDSR	Maternal and Perinatal Death Surveillance and Response
MoH	Ministry of Health

MMR	Maternal Mortality Ratio
MUAC	Mid-Upper Arm Circumference
NHI	National Health Insurance
NICU	Neonatal Intensive Care Unit
NMR	Newborn Mortality Rate
NODE-IN/NODE-FOR (NINF)	Neonatal Death from Informant/ Neonatal Death Follow-on Review
ODK	Open Data Kit
PEMDA	*Pemerintah Daerah* (Local Government)
PHO	Provincial Health Office
Polindes	*Pondok bersalin desa* (Village post for delivery)
PONED	*Pelayanan Obstetri Neonatal Emergency Dasar (*Basic Emergency Obstetric and Neonatal Care/BEmONC)
PONEK	*Pelayanan Obstetri Neonatal Emergency Komprehensif (*Comprehensive Emergency Obstetric and Newborn Care/CEmONC)
Posyandu	*Pos Pelayanan Terpadu* (Integrated Community Health Post)
PRD	Pregnancy-Related Deaths
PUSKA UI	*Pusat Penelitian Keluraga Sejahtera Universitas Indonesia*
Puskesmas	*Pusat Kesehatan Masyarakat* (Community Health Center)
Puskemas Pembantu (Pustu)	Community Health Sub-Center
RT	*Rukun Tetangga*
SB	Stillbirth
SBA	Skilled Birth Attendant
SES	Socio-Economic Status
SRS	Surveillance and Response System
TB	Tuberculosis
TBA	Traditional Birth Attendant
ToT	Training of Trainers
UI	Universitas Indonesia
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VASA	Verbal Autopsy/Social Autopsy
WHO	World Health Organization
WRA	Women of Reproductive Age

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EXECUTIVE SUMMARY

BACKGROUND

The 'Every Mother and Newborn Counts' (EMNC) study undertaken by the United States Agency for International Development (USAID) Jalin Project was conducted in 2018 / 19 to provide a deeper understanding of the causes and pathways that lead to maternal and newborn mortality in two districts in Indonesia.

Maternal and neonatal mortality rates in Indonesia remain high. The latest inter-censal report estimated the maternal mortality ratio as 305 maternal deaths per 100,000 live births[1]. While Indonesia has made progress in addressing child mortality, newborn mortality rates have remained almost unchanged over the last thirty years, with a rate that has only recently dropped from an estimated 19 to 15 neonatal deaths per thousand live births.

Yet little is known about detailed causes and pathways, including the care- seeking behavior, leading to these deaths. Against this backdrop, the EMNC study aims to inform program priorities, policies and action.

METHODOLOGY

Data was collected in two districts between December 2018 and April 2019. Following the eligibility criteria for this study (maternal deaths in past two years, neonatal deaths in past six months) a total of 110 maternal and 154 neonatal deaths were identified in Jember District in East Java Province, and 118 neonatal deaths in Serang District in Banten Province where maternal mortality was already assessed during the Banten II study. The districts were selected based on high maternal and neonatal mortality burden and local government commitment following a consultation with the Ministry of Health (MOH) and Provincial Health Offices (PHO).

First, the study team enumerated all eligible maternal and neonatal deaths in the study areas using a proven method for counting these mortality events, known as Maternal Death from Informant/Maternal Death Follow-on Review (MADE-IN/MADE-FOR) and Neonatal Death from Informant/ Neonatal Death Follow-on Review (NODE-IN/NODE-FOR). Once eligibility was confirmed, each household experiencing a maternal or neonatal death was visited by a trained interviewer. The interviewers conducted a 'verbal and social autopsy' (VASA) interview with family members or household caregivers of the deceased to determine the likely causes of death and the circumstances surrounding the death. Causes of death were analyzed using the InSilico computer algorithm.

MATERNAL DEATHS IN JEMBER

The EMNC study identified common characteristics amongst women who died. Maternal deaths were higher among pregnant women who have less formal education than other women in Jember. Family informants reported that many of the women had hypertension, that most received the recommended sequence of antenatal visits, and that emergency help was ten minutes or less away by usual means of transport.

Among the deceased mothers, nearly all sought formal care for their fatal illness events and most experienced only minor delay – only those who sought traditional care first were delayed by more than 12 hours from reaching formal care. About half of the women paid out of pocket at the first care provider, and two thirds of those who are enrolled under the most common type of insurance used it.

Most women who delivered in public hospitals were attended by a physician or midwife. Roughly half the women experienced at least one complication (high blood pressure, pre-eclampsia, intrapartum hemorrhage or postpartum hemorrhage) and one in five had a prolonged labor of greater than 12 hours.

Ultimately, three quarters of maternal deaths occurred in public hospitals, of which two thirds happened within the first week after delivery, most often due to hemorrhage, pregnancy-induced hypertension, or pregnancy-related sepsis.

Study data indicates that most women are receiving standard care (e.g. correct number of antenatal care [ANC] contacts; deliveries by skilled birth attendants; and the opportunity to manage complications in formal health care settings). It must be stressed, however, that the study did not directly examine the quality of the facility based care. Evaluation of quality of care of the services actually provided is needed to ensure implementation of interventions known to prevent common causes of death.

The following statistics outline the findings about women who died during or shortly after birth:

BEFORE LABOR AND DELIVERY...

- **42%** had no formal or only primary schooling
- **30%** experienced high-blood pressure
- **67%** received recommended sequence of ANC visits

DURING LABOR AND DELIVERY...

- **47%** experienced high blood pressure, pre-eclampsia or eclampsia
- **53%** experienced intrapartum or postpartum hemorrhage
- **80%** were attended by a doctor or midwife

MORTALITY AND CAUSES OF DEATH...

- **75%** of all deaths occurred in public hospitals
- **82%** of those who delivered in a hospital also died in a hospital
- **36%** died during delivery or the first 24 hours postpartum
- **14%** died between days 2 - 7 postpartum
- **46%** died from hemorrhage or pregnancy-induced hypertension

CARE SEEKING AND INSURANCE USE...

- **63%** lived within ten minutes of the nearest emergency center
- **98%** sought formal care
- **68%** delivered in a hospital
- **55%** paid out-of-pocket at first provider
- **65%** used JKN PBI-APBN at first provider (of those enrolled)

NEONATAL DEATHS IN JEMBER AND SERANG

The analysis of neonatal deaths showed differences in demographic characteristics and use of health care services between the two study districts that could affect neonatal mortality. Mothers in Jember were more likely to marry as teenagers and were younger when they had their first child compared to Serang. However, despite their relative youth, mothers in Jember were more likely to complete the recommended ANC sequence and were less likely to seek ANC from a traditional birth attendant (TBA). This tendency for Jember mothers to more readily use the health care system was also evident in their choice of where to give birth and to seek care for their sick neonates: 87 percent of Jember mothers verses 77 percent of Serang mothers delivered in a hospital or other facility; and 13 percent of mothers in Jember verses seven percent of mothers in Serang decided to seek care for their neonate when s/he was mildly ill, while 55 percent in Jember verses 62 percent in Serang waited until the child was severely ill.

These differences in care-seeking behavior do not appear to be due to any substantial variation in educational attainment as both showed comparable figures: around one third of mothers in both districts completed primary school, and 67 percent in Serang verses 69 percent in Jember had completed primary school or any junior high school. However, access to health care may have played a part. A greater proportion of families in Jember compared to Serang lived within five minutes' distance to the nearest emergency care facility.

Significantly more families in Serang paid out-of-pocket for neonatal care for the first health provider contact compared to Jember. This difference was greatly magnified for ANC, for which almost three times as many Serang mothers as Jember mothers paid all or some of the cost out-of-pocket. Health insurance coverage may partially explain these differences in access: more than twice as many families in Jember as in Serang used *Jaminan Kesehatan Nasional Penerima Bantuan Iuran – Anggaran Pendapatan Belanja Daerah* (National Health Insurance – where the premium is paid by the local government—JKN PBI-APBN) or Jamkesda (*Jaminan Kesehatan Daerah*—insurance for the poor) at both the first and last visits to a provider to seek care for their newborn.

More than 80 percent of deceased neonates were born in a hospital or other facility, and the fatal illnesses of 88 percent of these neonates (or 73 percent of all neonates) began in the hospital (44 percent) or other facility (29 percent) where they were born. Two-thirds of the mothers of neonates whose illness began in the delivery facility had a labor and delivery complication. This was higher for those who delivered at a hospital (nearly three-fourths) compared to those delivering in another facility (nearly half). In contrast, less than one-third of mothers who gave birth at home or delivered a healthy newborn at a facility had a labor and delivery complication. These findings suggest that mothers with a complication were more likely to seek care or be referred to a health facility, more often a hospital, than mothers without a complication.

Mothers with a complication and whose newborns' illness started at the delivery facility had trouble reaching that facility. Three-fourths of those who delivered at a hospital and more than a third of those who delivered at a lower-level facility sought care from as many as three other providers or facilities before ultimately reaching the facility where they delivered. This delayed their arrival at the delivery facility by a median of two and a half hours—all the more important given that the most common complication was prolonged labor of 12 or more hours.

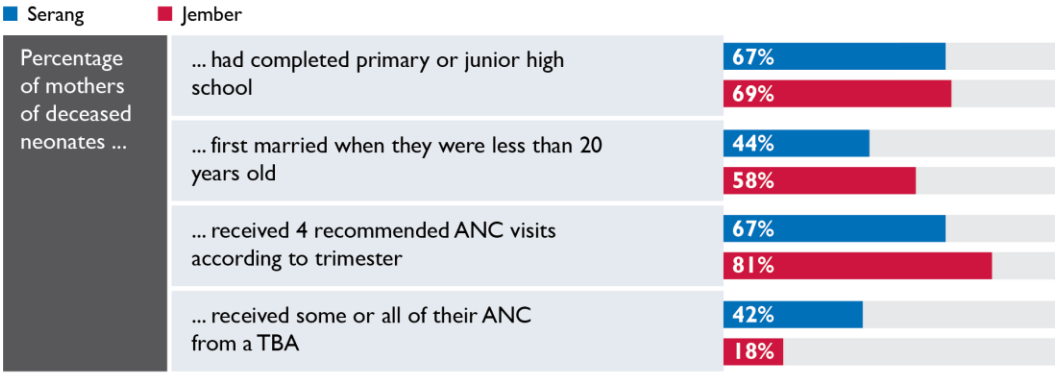
Sixty percent of neonates whose illness began in the delivery facility died there without leaving, including 79 percent of those delivered at a hospital and a third of those born in a lower-level facility. Overall, half of the deceased neonates identified in the study died at a hospital within the first week of life, including 19 percent who died on the day of birth. The most common cause of death of these neonates was prematurity, contributing 84 percent of day-0 deaths and 66 percent of deaths on days one through six. Prematurity was also the most common cause of neonatal death beyond the first week, contributing 49 percent of deaths on days seven through twenty-seven. Birth asphyxia was the second most common cause during the first week, while neonatal pneumonia was the second most common cause after the first week.

The importance of effective referral is highlighted by examining the care-seeking pathway: Forty-three percent of neonates whose illness started in their delivery facility were referred, but 30 percent of these neonates died before being able to act on the referral; and 10 percent of the neonates left the delivery facility alive but were not referred, despite two-thirds of those 10 percent being in moderate or severe condition upon departure. In addition, while 14 percent of all deceased neonates were born at home, 24 percent died at home, suggesting that many critically ill neonates were sent home or ineffectively referred from facilities before fully recovering.

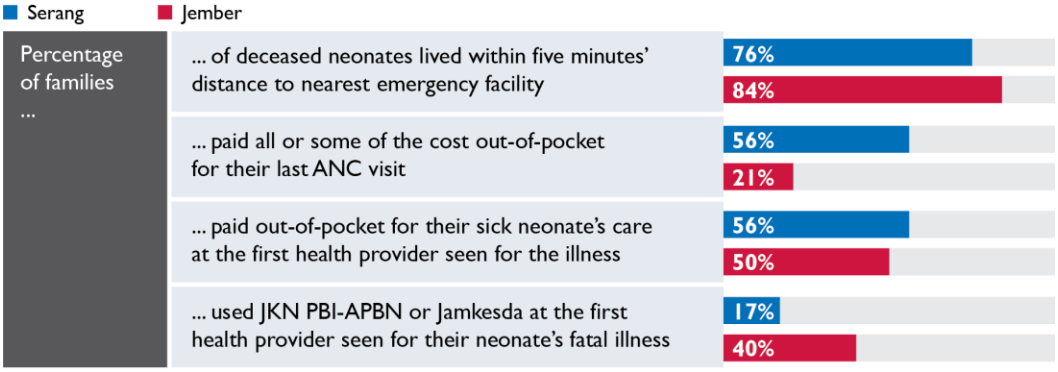
While a health facility assessment is needed to more fully examine these issues, the EMNC study provides evidence that the main factors to decrease neonatal mortality include access and effective referral of women with obstetric complications to appropriate facilities; improved management of obstetric complications at delivery facilities; improved management of premature and asphyxiated neonates at delivery facilities, including stabilization and triage and effective referral; and improved management of pneumonia in neonates between seven and 28 days of life.

The following statistics outline the findings about neonates who died during or shortly after birth:

BEFORE LABOR AND DELIVERY



SEEKING CARE AND INSURANCE USE



DURING LABOR AND DELIVERY

of mothers of deceased neonates delivered at home without a skilled birth attendant

of mothers of deceased neonates delivered in a hospital or other health facility

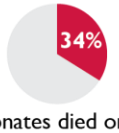
of mothers of neonates whose illness began in the delivery facility had a labor and delivery complication

MORTALITY AND CAUSES OF DEATH

of deceased neonates' fatal illnesses began in the hospital (44%) or other facility (29%) where they were delivered

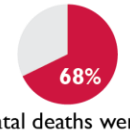
of deceased neonates born in a hospital died in a hospital within one week of birth

of deceased neonates referred by the first health provider died before leaving the facility



of all neonates died on the day of birth

of all deaths occurred on days zero through six



of neonatal deaths were due to prematurity

CONCLUSIONS AND RECOMMENDATIONS

The large number of maternal and neonatal deaths in hospitals indicates weaknesses in the referral system and most likely in the quality of care provided by the health professionals, although this was not specifically assessed in this study. The key recommendation is to improve the quality provided during ANC and obstetric emergency care for all pregnant women in case of increased risks or complications. This can be achieved by firstly improving the facilitative supervision for providers throughout pregnancy and delivery, and ensuring all procedures are conducted according to protocol. Secondly, there is a need to strengthen the referral system, including rapid assessment, referral and transport of laboring women with complications to an appropriate delivery facility. Referral hospitals should have at least one trained obstetrician on staff to conduct complicated deliveries and supervise less trained staff. Staff of delivery facilities, especially sub-hospital level facilities that conduct deliveries, need to be trained to urgently assess and refer women who arrive in labor and develop complications. Lastly, to improve identification of risks and danger signs during the early postpartum period, it is recommended that providers ensure families are aware of danger signs and know what to do if they occur, and postpartum visit programs are strengthened so that providers actively seek signs of postpartum hemorrhage, infection/sepsis and pregnancy-induced hypertension.

Regarding neonatal deaths, implementing the recommendations above will help to reduce deaths if hospitals are better prepared to manage obstetric complications. The referral system as a whole needs to be improved to reduce loss of neonates who die soon after birth. The study findings point to the importance of improving management, especially in hospitals but also in lower-level facilities, of common neonatal disorders; and of effectively referring and transferring neonates who require more highly specialized care to a hospital with Comprehensive Emergency Obstetric and Newborn Care. Staff needs to be trained on neonatal resuscitation and essential newborn care including care for premature newborns. Additional staff trainings on newborn care should be guided by the World Health Organization (WHO)/the United Nations Children's Fund (UNICEF) Integrated Management of Neonatal and Childhood (IMNCI) Illness guidelines and should focus on timely assessment, optimal care, and referrals for sick neonates. Before discharging mothers after giving birth, staff should know how to counsel mothers on signs of illness and ensure parents know where to bring their newborn if signs appear. Parents should also receive follow up appointments for PNC and neonatal care including vaccination.

The EMNC study has led to important findings that have programmatic and policy implications to accelerate reduction of maternal and neonatal deaths. However, it also presents areas for further research to enhance the information available to support Government of Indonesia entities to design effective policies and inform budgetary decisions. These include: 1) assessment of quality of service provision and needs for provider capacity building; 2) the relationship between the National Health Insurance and the referral system and accessing maternal and neonatal health services.

1 INTRODUCTION

This report presents findings, conclusions, and recommendations from the 'Every Mother and Newborn Counts' (EMNC) study undertaken by the USAID Jalin Project. The purpose of the study is to provide a deep understanding of the causes and conditions of maternal and newborn mortality and how they vary across districts in Indonesia. Specifically, these data will inform the prioritization and development of interventions (including strengthening of the MOH led Maternal and Perinatal Death Surveillance and Response – MPDSR- system) to combat maternal and newborn mortality. Priorities to accelerate progress to reduce maternal and newborn mortality should be informed by improved information on the determinants of and the circumstances under which those deaths occur.

1.1 MATERNAL AND NEONATAL MORTALITY DATA IN INDONESIA

Maternal and neonatal mortality in Indonesia remain high. The Indonesian Demographic and Health Survey (IDHS) indicates an increase in the maternal mortality ratio (MMR) between 2007 (228/100,000) and 2012 (359/100,000) [1] [2] and the latest inter-censal estimates found a ratio of 305/100,000 [3]. In 2017 WHO estimated the MMR in Indonesia to be 177/100,000, which is higher than the neighboring countries i.e. Malaysia (29/100,000), Thailand (37/100,000), and the Philippines (121/100,000) [4].

While Indonesia has made more progress in reducing child mortality, newborn mortality has remained almost unchanged over the last thirty years with a rate of 19 death per 1000 live births by 2012 [2]. It was not until 2017 that a reduction of the newborn mortality rate (NMR) to 15/1000 live births was seen [5]. Compared to other neighboring countries, i.e. Malaysia (4.3/1000), Thailand (5.3/1000), and Vietnam (10.8/1000), the Indonesia NMR was higher at 13.2/1000 live births in 2017 [6].

Newborn mortality comprises almost 50 percent of all under-five child deaths and about 63 percent of infant child deaths. It is typically up to three times higher among neonates born to the poorest households compared with the wealthiest [7]. Neonatal health, especially in the first week of life, is closely linked to that of their mothers, and thus, improvement of maternal health is essential for improvement of newborn outcomes [8].

Yet detailed information on causes and circumstances of these deaths remains scarce. Although national estimates exist, little information is available about deaths occurring outside of facilities; and facilities themselves have incomplete information [8]. Many deaths that happen outside of facilities are not reported or audited, providing no guidance on key points of intervention.

Information about underlying causes of maternal and neonatal deaths is limited, especially at sub-national level. For example, there is scant information about low birth weight and prematurity in newborns and anemia among pregnant women. Comparisons between the IDHS and the current census estimates show that census and survey data represent less than 50 percent of the actual deaths taking place. [9]. The one exception is a series of studies conducted in two districts and one municipality of Banten Province, where findings were remarkable for the number of total deaths identified, and the circumstances of those deaths [10].

Furthermore, national-level estimates of maternal and neonatal mortality do not provide any information about sub-national variation in the occurrence and causes of maternal and neonatal deaths. Because of the decentralized structure of Indonesian government, sub-national estimates are critical for decision-

makers at district levels. Several small studies identified stark geographic disparities at the district and sub-district levels [11] [12] [13] [14], which suggest that more refined estimates are needed for district-level policy-makers to make informed programmatic decisions. Disparities in distal determinants of health and mortality within districts also suggest tailored approaches to target maternal and newborn health outcomes may be most effective. These disparities include the rate and proportion of those in poverty, education, and access to healthcare services [15].

The EMNC study addresses some of these data gaps and provides current information on maternal and newborn mortality in two districts in Indonesia. The study is designed to give a more nuanced picture of the circumstances and causes of maternal and newborn deaths. The study also aims to generate additional information about the pathways leading to mortality and thereby identify points of intervention.

1.2 STUDY DESCRIPTION

The EMNC study was funded by USAID/Indonesia through the USAID Jalin Project. The project was initiated in September 2017 through a contract with DAI, as a five-year project that supports the MOH to achieve an accelerated reduction in maternal and newborn deaths. The EMNC study identified all maternal and neonatal deaths in Jember District in East Java Province and all neonatal deaths in Serang District in Banten Province.

For East Java, the study district was selected based on input from the MOH and PHOs and considering that the Jalin Project is operating in this province. Furthermore, selection also considered representativeness, commitment of local government, population size, the presence of other surveys (e.g. Sample Registration System [SRS] or the MPDSR), mortality rates, and whether the location is in the MOH's MNH priority list. For Banten, Serang District was selected, which was the study site of the Banten II study. The reason for the selection of Serang District for the Banten II study was to select one of the three areas of the previously implemented University of Aberdeen Initiative for Maternal Mortality Program Assessment (Immpact) study, i.e. Pandeglang, Serang District and Municipality. Serang District was selected because among the three areas it is the most representative for Banten Province (mix of urban, rural, and remoteness).

Enrollment of deaths consisted of identifying all maternal and newborn deaths via a listing meeting (LM) exercise carried out with two different types of community informants. These informants were asked to compile lists of maternal and newborn deaths in each catchment area over the past two years or six months, respectively. The lists from the two informant sources were compared and compiled by the field staff. A confirmation visit was conducted to each household of the reported death case to verify a death's eligibility for the study (e.g. with regard to age at death, or place of residence of the deceased). For deaths among women of reproductive age (WRA) we verified whether the death occurred during pregnancy, delivery, or within 42 days after delivery. This study did not include late maternal deaths (more than 42 days but less than one year after termination of pregnancy).

Once deaths were identified and confirmed as eligible for the study, field staff conducted a VASA [16] interview with household respondents (primarily care-givers or other family members considered as the most knowledgeable informants). Data obtained through the VASA were used to determine the cause of death and to analyze relative health system-related and social determinants of maternal and newborn

deaths. This analysis was synthesized to generate findings and recommendations to prioritize interventions targeting reduction in maternal and newborn mortality.

The subjects of this study were:

- Women who died during pregnancy, childbirth or within 42 days of childbirth in Jember District; and
- Newborns who died within 28 days of birth in Jember and Serang Districts.

Deaths among WRA (13-49 years) who died within the last two years and among newborns who were born and died in the last six months were eligible for the study.

All information obtained about the informants, the household of the deceased, about deaths and the circumstances surrounding the deaths is kept confidential and in compliance with the research protocol and local regulations. Results of this study may benefit study respondents and their communities by identifying critical intervention points to improve care for mothers and newborns, and to reduce the high burden of maternal and newborns deaths in the study districts and possibly in other areas of Indonesia.

1.3 OBJECTIVES OF THE STUDY

The objective of the study was to provide evidence to construct tailored care seeking pathways for maternal and newborn mortality in these Indonesian districts that will inform priorities for innovation, policy, and program actions to reduce maternal and newborn mortality at scale. The EMNC study will generate detailed information on maternal and newborn intervention priorities that are required for policy and program decision-making and action. The study will also contribute up-to-date information about the circumstances and causes of maternal and newborn mortality for a better and more nuanced understanding of care seeking pathways, and potentially to the routine enumeration in systems like the MPDSR system. The EMNC study will also be used for policy-oriented data synthesis and used to inform the development of a white paper to strengthen the MNH National Action Plan.

2 STUDY DESIGN & METHODOLOGY

This study method was modelled on previous studies conducted in one province in Indonesia in 2004 and 2015 using the MADE-IN/MADE-FOR (MIMF) methodology [17] for maternal deaths, and the NODE-IN/NODE-FOR (NINF) method for neonatal deaths.

First, both methods relied upon undertaking independent listing exercises (the 'MADE-IN' and 'NODE-IN' components) of deaths in WRA and newborns in the first 28 days of life using the two types of local informants which in this study are *kader* (community health volunteer) and *Rukun Tetangga* (RT). Kaders are community health volunteers, mostly females, literate and active members of the community who assist health providers in integrated community health post activities (known as Posyandu). Heads of RTs are also volunteers, selected by the community to lead the neighborhood. The RT unit is the smallest community unit within the village, which consists of approximately 40-100 households. There are usually 10-20 RTs in a village.

Next, the lists from informants were consolidated as a complete master list of the relevant deaths in the area. From these lists, a complete enumeration of pregnancy-related deaths (PRDs) in the last two years and stillborn in the last six months was carried out in the study district. A structured VASA interview – the 'MADE-FOR' and 'NODE-FOR' steps – was conducted for each PRD and stillborn to identify the cause of death and other factors that may have contributed to the fatal outcome.

The VASA tool used is an integration of two questionnaires, which are Verbal Autopsy (VA) 2016 from the WHO and the Social Autopsy (SA) from the Institute for International Programs of John Hopkins University (JHU), comprising the following main information: verification of death, general information about the death cases, medical and accident history associated with final illness, general signs and symptoms associated with the final illness, pregnancy and delivery complication, newborn care, care seeking prior to death, and household characteristics.

Data were collected using a tablet computer running the VASA tool under the Open Data Kit platform, and then transmitted electronically to *Pusat Penelitian Keluraga Sejahtera Universitas Indonesia* (PUSKA UI) for storage, management, cleaning, and analysis. During data collection several supervisory visits took place, and data were checked on a routine basis. Analysis was carried out using STATA and SPSS statistical software packages, with cause of death being assigned by the InSilicoVA computer algorithm.

2.1 SELECTION OF STUDY SITES

One district in each of two provinces was included in this study: Jember District in East Java, and Serang District in Banten. The one district within each province was selected based on consultation with the MOH and PHOs. Selection criteria included presence of or planned Jalin project intervention activities, high maternal and neonatal mortality burden, and/or commitment of the local government.

For the purposes of district selection, the study team initially identified three candidate districts in each province for consideration to be included in the study. These initial selections were based on the criteria outlined above. In each study province, the study team visited the provincial-level government to gain support and explain the selection criteria and process and to discuss and agree on which district will be selected as a study site. Specifically, for Serang District, the primary reason for the selection was to leverage the previous maternal mortality studies in Banten, in which Serang District was among the

study areas. Among the districts included in the Immpact and Banten II studies, Serang District had the highest number of maternal deaths. Furthermore, by selecting Serang District, the maternal deaths data from Banten II Study can be used to obtain a complete picture of maternal and neonatal mortality in the district.

In Jember District, we collected information on both maternal and neonatal deaths. In Serang District, the study only focused on neonatal deaths because a study on maternal deaths had been conducted in 2017 through the Banten II Study.

2.2 DEATH IDENTIFICATION AND INCLUSION/EXCLUSION CRITERIA

In Jember District, censuses of WRA and stillborn were developed as described above, while in Serang District only a census of the stillborn was made. The recall period for maternal deaths was two years and the recall period for stillborn was six months.

Although maternal deaths bring heavy burdens, they are nevertheless rare events. Therefore, a two-year recall period was used to increase the likelihood of obtaining a sufficient number of events for a robust analysis (particularly for VA), while still maintaining quality information by minimizing recall bias. A six-month recall period was used for neonatal deaths (which are more frequent than maternal deaths). To ensure all neonatal deaths were captured and correctly identified as 'alive at birth', we included questions that allowed to differentiate between death after delivery and stillborn (including stillbirths and Intra Uterine Fetal Deaths [IUFD]). We also assumed that the details of neonatal death might suffer more from recall bias than those pertaining to a maternal death. Therefore, a six-month recall period was further deemed appropriate to mitigate this potential source of bias.

The MADE-IN and NODE-IN methodology was employed to identify PRDs and stillborn, respectively.

2.2.1 IDENTIFYING NEONATAL DEATHS

The NODE-IN methodology is the same methodology as MADE-IN but revised to identify stillbirth and deaths of live born newborns. We included stillbirth in the NODE-IN to ensure that we do not miss any neonatal deaths misclassified as stillbirths or IUFDs by village informants.

Further screening was conducted by the field staff to determine whether the death was a stillbirth or live birth and died within the neonatal period. As mentioned above, both the MADE-IN and NODE-IN methodology use community informants, community health volunteers (*kaders*) and sub-village/neighborhood leaders (*Rukun Tetangga*/*RTs*), to generate a sampling frame for the study. Informants were identified and invited to participate in the study by the village head using an invitation package provided by the study team. The invitation package contained a recruitment letter that explains the study and expectations for participating informants. It also included a listing form on which the community informants were asked to list all deaths to women between the ages of 13-49 in the last two years and all stillbirths and newborns who died within 28 days of birth in the last six months, in their respective catchment areas (a time span to recall deaths up to 30 days was asked for, to ensure that all eligible deaths were recorded). We used the cut-off of 13-49 years instead of the commonly used 15-49 years for WRA to minimize the possibility of missed cases of pregnancy in women less than 15 years old.

2.2.2 GENERATING THE CENSUS OF MATERNAL AND NEONATAL DEATHS

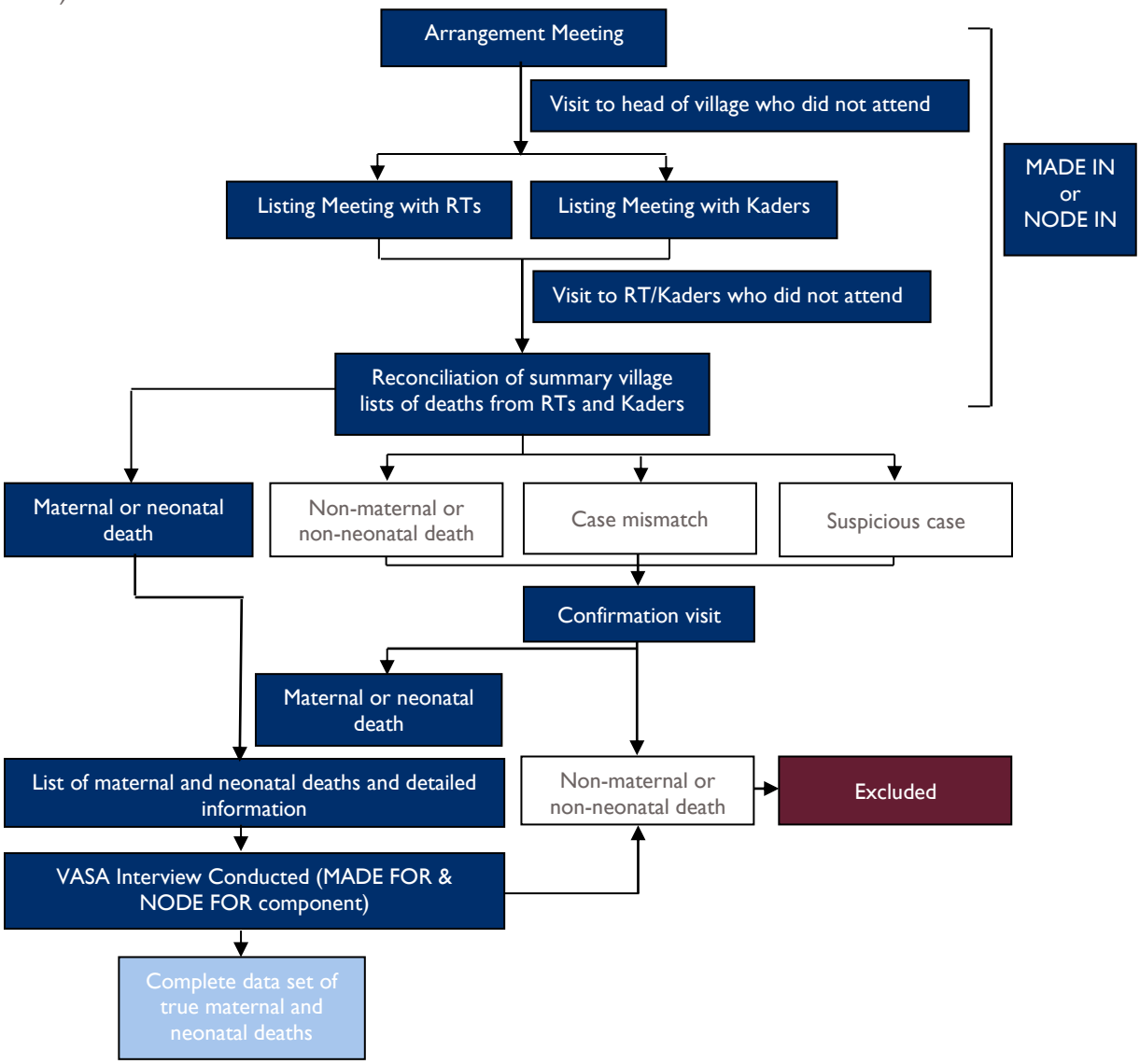
The informants were asked to bring the listing form to the LM, which was held separately for each type of informant. During the LM, for each identified death, the informants were asked to confirm: (i) the timing of deaths in relation to any pregnancy (women) or birth (stillbirth /newborns); (ii) age of the deceased; (iii) residence of the deceased; and (iv) name and contact information for a relative of the deceased.

During the LM, consolidated lists of deaths to WRA, likely PRDs, stillbirth and neonatal deaths were developed. The village informants were probed to help them recall any other deaths that they might have missed. The lists were then assessed through discussion with each informant group and the study team eliminated any duplicate listings of deaths. The MADE-IN listing method has been described in detail elsewhere [17] [18] [19].

2.3 RECRUITMENT

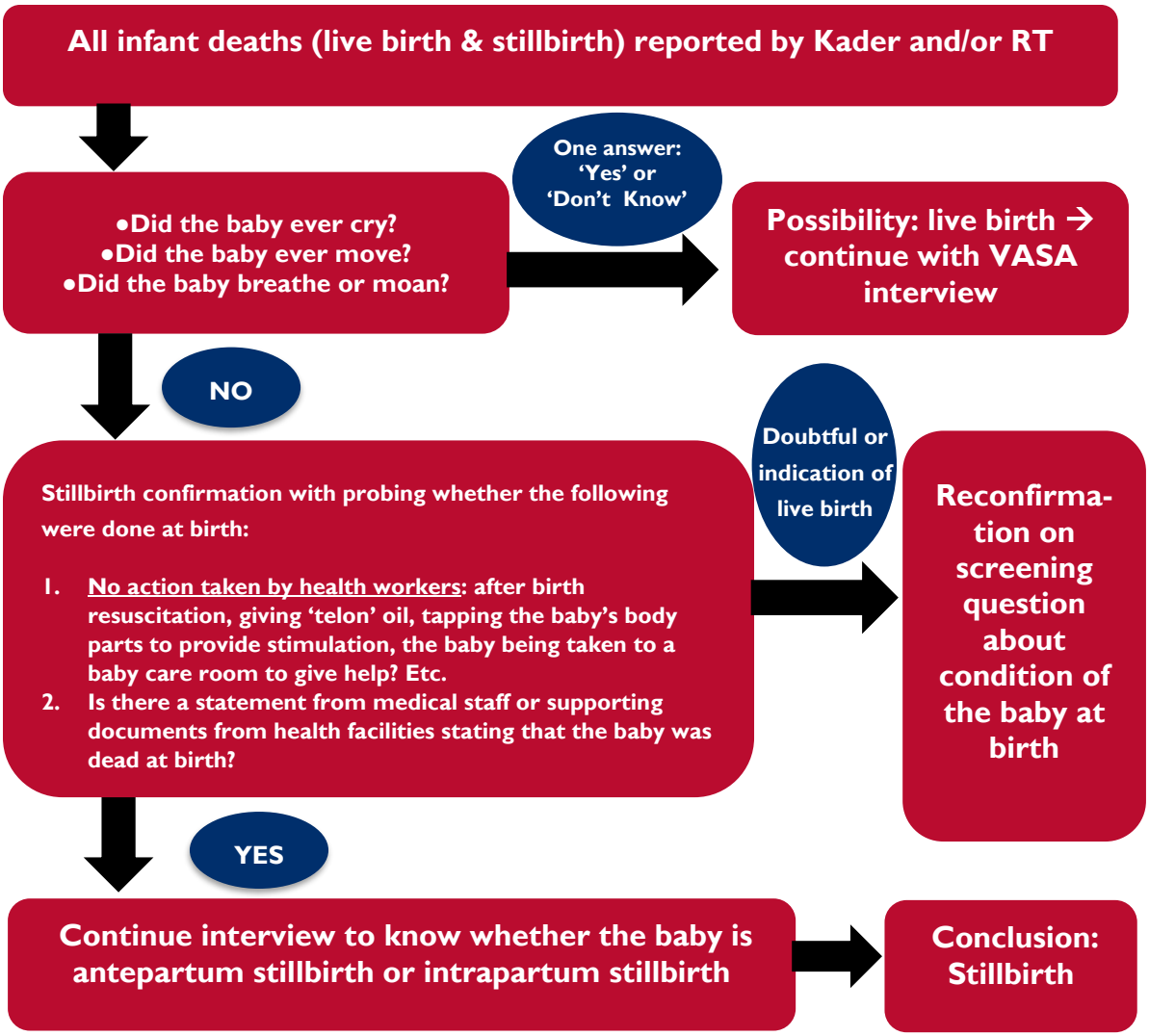
All suspected PRDs, stillbirth and neonatal deaths were followed up by establishing contact with the nearest kin of the deceased. A household visit was conducted to verify each questionable PRD and/or stillborn to determine eligibility for the study. Up to three attempts were made to visit each household. The flow of enumeration/death identification is depicted below (Figure 1).

FIGURE 1: DATA COLLECTION FLOW CHART (ADAPTED FROM: UNIVERSITY OF ABERDEEN, 2007)



To ensure that we collected neonatal deaths, and not infants who were stillborn, we developed a flowchart to differentiate between the two deaths.

FIGURE 2: FLOW CHART OF LIVE BIRTH/ STILLBIRTH CONFIRMATION-EMNC STUDY



In each district, the data collection started with an Arrangement Meeting (AM). This meeting at the sub-district level had the objectives of: 1) providing information about research activities to the heads of the villages; 2) obtaining permission to carry out the planned activities; and 3) making all the necessary decisions and plans for the LM.

Second, at the LM an agreed list of maternal and neonatal deaths in each village was produced based on information from the village informants (*kader*s from all villages, and *RTs* from sampled villages). Because stillborn are more prone to recall bias than adult deaths, to minimize under-reporting the field teams were provided with a document consisting of a list of information to probe for neonatal deaths. The list was intended to assist informants in recalling stillborn that occurred in their area. The team conducted a home visit to village informants who did not attend the LM (mop-up). The purpose of the mop-up is to explain about the activities, collect the filled-in form, and probe for more information about death cases. Cases reported from the LM were then followed up by a home visit to the family of the deceased to conduct VASA interviews.

Third, VASA interviews were conducted for all stillborn reported (either live birth or stillbirth) in Serang and Jember, and for all maternal deaths reported in Jember.

For newborns, the interview with the family started with screening for eligibility. Eligible neonatal deaths proceeded with complete VASA interview while families with a stillbirth or ineligible neonatal death participated in a partial interview.

2.4 TRAINING FOR FIELD STAFF

2.4.1 TRAINING OF TRAINERS

Prior to conducting training of the field staff, Vital Strategies trained the PUSKA UI team on the VASA interview. The purpose of the Training of Trainers (ToT) was to provide an overview of the EMNC VASA research protocol and methodology. Participants included the PUSKA UI team, recruited personnel to be assigned to the field team during data collection, and staff from the MOH's National Institute of Health Research and Development (Litbankes). The ToT was facilitated by a team from Vital Strategies and was also attended by representative of USAID and the USAID Jalin Project. The ToT also provided an opportunity to check the accuracy of the translation of the VASA tool into Bahasa.

Field testing was done in the area of Tangerang Selatan, Banten. We interviewed the families of four maternal death and four neonatal death cases. Interviews were conducted in pairs/small groups. The team from USAID Jalin participated during the field test. We held a discussion after the field test to clarify some issues and VASA questions. Several changes to the questionnaire were agreed upon during the ToT, and discussions to finalize the questionnaires continued after the ToT.

Picture 1: Class session, Training of Trainers

2.4.2 TRAINING FOR FIELD STAFF

Training for field staff took place in each province upon the commencement of data collection. Most candidates have a background in midwifery, nursing or public health, with previous experience in community-based research conducted by national agencies or other research institutions.

Picture 2: Class session, Field Staff Training, Banten

Both in the Banten and East Java trainings, all materials were delivered during the class session, comprising AM, LM, step by step explanation of the VASA instrument and how to operate the Open Data Kit (ODK) using a tablet. Exercises and role playing were undertaken frequently since it is important to improve the enumerator's ability in conducting the interview and to be competent with ODK usage.

Picture 3: Field testing, Training of Trainers

Picture 2: Role playing session – Field Staff Training, East Java

Field tests for the two trainings were undertaken in the targeted areas, by conducting AM, LM with *kader*s, and LM with head of *RTs*. The purpose of the pre-testing was to become familiar with the flow of the questionnaire, timing of the interview, accommodate local answers, revise wording as appropriate and to test the ODK in a real interview. For Banten, the field test was done for three days (December 24, 26, and 27) in two sub-districts in Pandeglang District and involved 125 *kaders*, 68 head of *RTs* and 21 village heads. Field testing for East Java was carried out for three days (January 17, 21 and 22) in Bangkalan District and involved 219 *kaders*, 38 head of *RTs*, 59 head of *dusun* (the lowest community group in most areas of Jember – it is equivalent to *RT* but with a larger area) and 73 village heads. Bangkalan District was chosen as a field test site because of the number of maternal/ neonatal deaths reported and the demographics or character of the community are relatively similar to Jember (consisting of Madurese). The VASA interview was conducted for ten maternal cases and 21 neonatal cases which were spread across the 73 villages of four sub-districts.

In addition, at the end of each training, a data quality assurance session was administered, involving the core team, field coordinator, assistant for field coordinator, field data management team and field finance team. The purpose was to train participants on how to assure the quality of data gathered, by establishing a scheme for review and rechecking.

Assessment of all candidates were conducted throughout the training, and the decision on the candidates who passed screening were announced toward the end of the training. The decision was based on their performance during training, including their active participation, interview capabilities, communication skills, team work, and overall attitude. Banten selected 24 team members (out of 33) to conduct the data collection, while East Java selected a total of 71 (out of 76) field staff. They were

assigned to the following roles: interviewer, team leader, assistant for field coordinator, field coordinator, data entry person, field data officer and field finance and logistics person. Those selected were then assigned into teams of four, by considering several aspects such as their origin, and educational background/field experience. Data collection teams included both women and men, so that women interviewed the families while men coordinated with the *RTs* and *kaders* and supervised the assessment teams.

The local stakeholders gave their support to the study by participating in the training and maintaining communication and coordination throughout the project. They included representatives of MOH, local health offices, local partner universities, and the Jalin Project in each province. Furthermore, this study engaged other universities as partners: Airlangga University for East Java and Diponegoro University for Banten. Four senior and junior researchers from those universities were actively involved in the study, including in advocacy meetings with local government, training, data collection, and participation in the data analysis workshop.

The detailed reports on the field staff training for Banten and East Java were previously submitted to USAID Jalin in milestone completion reports.

Picture 3. Field testing for VASA Interview – Field Staff Training, Banten

Picture 4. All participants – Field Staff Training, East Java

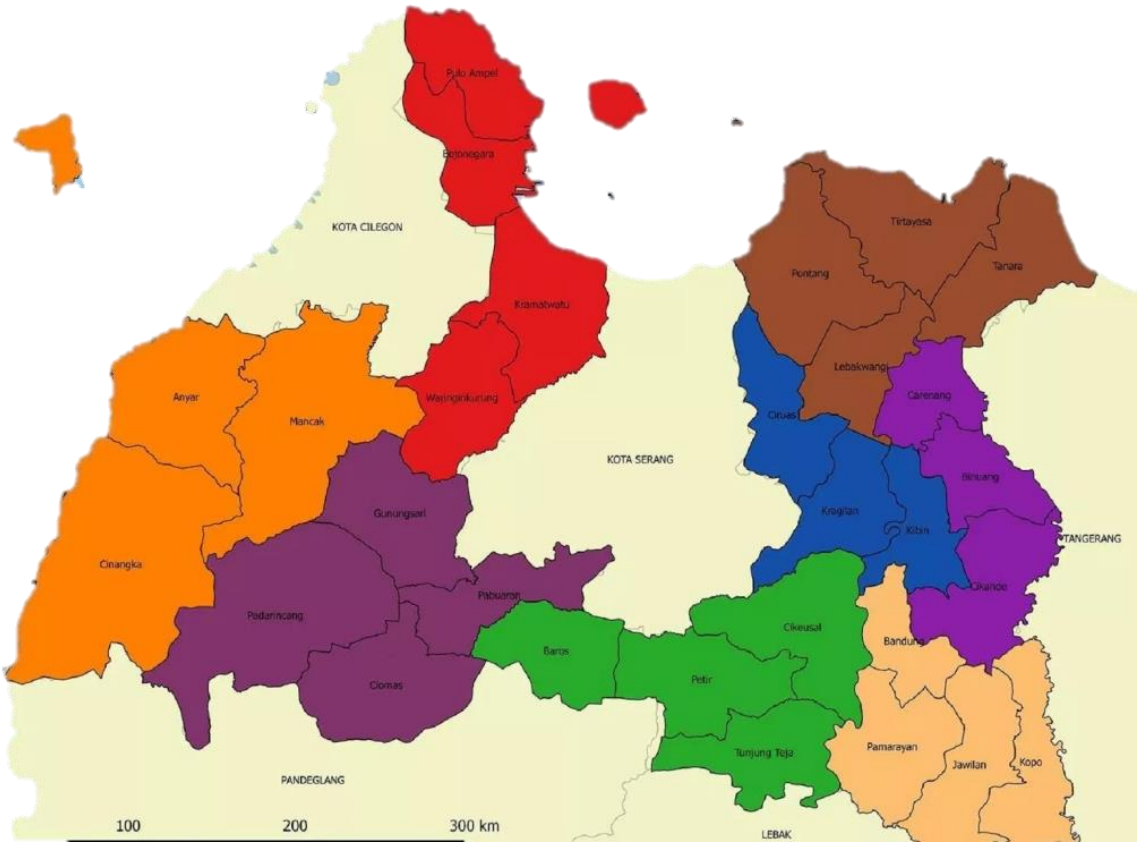
Picture 7: Representative of Serang DHO giving her opening remarks – Field Staff Training, Serang

Picture 8: Representative of East Java PHO giving her opening remarks – Field Staff Training, Jember

2.5 DISTRICT DESCRIPTION

2.5.1 SERANG DISTRICT, BANTEN

Picture 5: Map of Serang District



Serang District covers an area of 1,467.35 km^2 and has a population of 1,493,591 (or an overall density of 1,005 people per km^2). It comprises lowland and highland areas and altitude between 0 and 1,778 meters above sea level [20]. Serang District is located about three hours from Jakarta and has 29 sub-districts with 326 villages. Eight sub-districts together constitute the rural areas, while the rest are sub-districts with urban and rural topography. Seventy-eight percent of its villages are rural.

Twenty-nine percent of the population graduated from elementary school, 26 percent from junior high school, 22 percent from senior high school and 18 percent did not obtain any formal educational level. Bearing in mind potential under-reporting, the latest DHP health profile reported about 197 neonatal deaths and 131 stillbirths during 2017 [20], with more than ten cases found in each of the followings sub-districts: Kramat Watu, Carenang, Anyar, Lebak Wangi, Padarincang and Cikeusal. In the same year, 58 maternal deaths were reported in the district. The number of maternal deaths in the health management information system, however, was lower than that found in 2015-2017 during the Banten II Study (155 deaths) [21]. The life expectancy rate in the district (63 years) is lower than the national figure (69 years) [20].

Data on ANC for 2017 recorded that K1 (antenatal visit in trimester 1) coverage was 93 percent of the target of 31,767 pregnant women. This percentage increased in 2018 to 100 percent, while K4 (all four ANC visits completed) coverage was 83.8 percent, increasing in 2018 to 92 percent [20] [22]. The district reported that 90.6 percent of deliveries occurred in health facilities in 2017.

Serang has four hospitals, one of which is a public hospital and functions as a regional referral center. Two of the four hospitals have PONEK (Comprehensive Emergency Obstetric and Neonatal Care/CEmONC) capacity and have Neonatal Intensive Care Units (NICU). The district has 31 *puskesmas*, 17 of which are *puskesmas* PONED (*puskesmas* with Basic Emergency Obstetric and Neonatal Care/BEmONC). However, according to information from the District Health Office (DHO), only eight of them are functioning properly. In addition, there are 49 satellite *puskesmas* (*puskesmas* with narrower area, usually located within villages), with 58 pharmacies. A total of 589 midwives work in the district, both at hospital and *puskesmas*. There are 1,169 traditional birth attendants (locally called 'dukun') in the district, but almost all of them (92 percent) are reported to have built partnerships with local personnel from the formal health care sector. The partnership means that the *dukun* are prohibited from providing delivery care. Instead, *dukun* are asked to report any pregnant women and women in labor to the village midwives. The implementation of this partnership, however, remains uneven. In addition, it was reported in 2018 that 75 percent of the population has registered into the *Jaminan Kesehatan Nasional* (*JKN*) insurance scheme. The local government is quite confident in reaching total coverage by the end of 2019 as targeted by the central government [23].

2.5.2 JEMBER DISTRICT, EAST JAVA

Picture 6: Map of Jember District

Jember district has a total area of 3,092.34 km², 31 sub-districts and shares its borders with the districts of Lumajang (to the west), Probolinggo, Bondowoso and Situbondo (to the north), and Banyuwangi (to

the east). There were 2,3430,185 people living in Jember according to the 2017 census, an average density of about 737,9 people/km² [24].

Jember is a heterogeneous area where many ethnic groups mingle and live together. Most of its population are Javanese and Madurese, with a small percentage of ethnic Chinese, Balinese, Arabic and Indian. Just over a third (38.6 percent) obtained elementary school level, followed by junior high school (22.5 percent) and senior high school (21.2 percent).

Bearing in mind potential under-reporting, the latest DHO report from Jember district found there were 233 stillborn (within the first year of life) during 2017. Maternal deaths reported by the district in 2017 and 2018 were 49 and 41, respectively [25].

Data on ANC for 2017 recorded that K1 (antenatal visit in trimester 1) coverage was 99.9 percent of the target of 39,804 pregnant women and K4 coverage was 81.1 percent, increasing in 2018 to 88.5 percent. The district reported that 91.2 percent of deliveries occurred in health facilities in 2017. Jember has 13 hospitals, of which two are specialized hospitals (for pulmonology and dentistry). Among the 11 general hospitals, three are public hospitals, of which one functions as a regional referral center. Four of the 11 hospitals function as PONEK. Only two PONEK hospitals have a NICU (six beds in total). The district has 50 *puskesmas*, including 25 *puskesmas* PONED, satellite *puskesmas* (*puskesmas pembantu*) and 50 mobile *puskesmas*, with a total of 1,027 midwives working at both hospital and *puskesmas*. There are 815 traditional birth attendants (*dukun*) in the district. Furthermore, more than half (59.8 percent) of the population are already registered into national health insurance JKN, out of those 45.5 percent are covered under *Penerima Bantuan Iuran* (*PBI*) (the premium for poor and near- poor population which is paid fully by the local government).

2.6 DATA COLLECTION

Data collection was started in January 2019 and completed in April 2019. Prior to conducting any data collection, ethical clearance was obtained from the Biomedical Research Alliance of New York and the Faculty of Public Health, University of Indonesia's Institutional Review Board.

2.6.1 SERANG DISTRICT, BANTEN

Data collection in Serang District started on January 2 and was completed on March 31, 2019, covering all 29 sub-districts. In general, all the activities included pre-arrangement meeting (pre-AM), AM, LM, and VASA interviews were completed in the given time. Data collection was rolled out in clusters, with each cluster consisting of five sub-districts. Data collection lasted for about two weeks per cluster.

By the end of March 2019, the data collection team in Banten had finished AM in 29 sub-districts covering a total of 326 villages. The LM with *kader*s had higher attendance (96 percent) compared to LM with *RTs* (79 percent). In total, we were able to gather 1,338 *kader*s (out of 1,390) and 1,401 *RTs* (out of 1,784) during the data collection in Banten.

Mop-up visits were conducted with village leaders/*RT*/*kader* who did not attend LM. In total the field team reached ten village leaders, 321 *RTs* and 40 *kader*s in their mop-up activities.

After conducting verification of death cases listed by informants, the final step of the community-based data collection was a household visit for conducting the VASA interview.

Picture 7: LM *Kader*, Banten

Picture 92. Mop Up RT, Banten

Picture 83: VASA interview, Banten

2.6.2 JEMBER DISTRICT, EAST JAVA

Data collection in Jember District was completed on April 24, 2019, covering 31 sub-districts and 248 villages. It was rolled out in five clusters, with each cluster consisting of three to seven sub-districts.

All 31 sub-districts and 248 villages in Jember were covered by AM activities and completed by end of March 2019. The overall attendance rate of the head of villages (or their representatives) was 95.2 percent.

Picture 10: AM in Tempurejo Sub-district, East Java

The LM activity was completed in April 2019, involving 2,741 (out of 2,894) *kader*s and 6,252 *RTs* (out of 7,508). Overall, the attendance rates of *kader*s and *RTs* were 95 percent and 83 percent respectively. For the mop-up activity, we conducted visits to a total of 1,264 *RTs*, 153 *kader*s and 12 village leaders.

Significantly, we found that the proportion of ineligible cases for neonatal death was higher than eligible cases (see table 27). During the listing meeting, besides including stillbirth, we also included neonatal deaths with age of pregnancy <28 weeks to be confirmed during VASA interview (note that we used the cut-off point of 28+ weeks gestational age). Some of the informants were not confident about the exact age of pregnancy (in weeks). Most only remembered the age in months. Therefore, we still conducted VASA interviews for those cases to confirm the age of pregnancy. (This process was followed in Banten as well.)

Picture 125: LM RT Balung Lor, Balung Sub-district, East Java

Picture 116: Mop-up RT Umbulsari Sub-district, East Java

Picture 157: VASA interview, Jelbuk Sub-district, East Java

Picture 138: VASA Interview Sumberjambe Sub-district, East Java

Picture 149: VASA Interview Silo Sub-district, East Java

2.7 DATA MANAGEMENT

Electronic data collection was conducted using the ODK Collect application on tablets. Enumerators entered interview data directly into the tablets. Data were transferred over cell phone or other network/internet connections to an ODK Aggregate server (https://odk.swisstph.ch/ODKAggregatePuska). Each day, team supervisors checked the interviews for completeness and consistency before transmission to the central database.

The tablets were password protected. Data collected on the central ODK Aggregate server was backed up regularly. If data transmission from the tablets was not possible on the day of the interview (e.g. because of connectivity issues), the data collected in the interview was backed up from the tablet and submitted to the central server at a later time.

To ensure data protection and confidentiality throughout the study, all field staff were trained to use reasonable data protection measures. When data collection was completed, tablets were returned to the PUSKA UI, checked for completeness of data delivery, and cleared of all survey data. The UI team was responsible for conducting quality assurance related to data collection on a weekly basis.

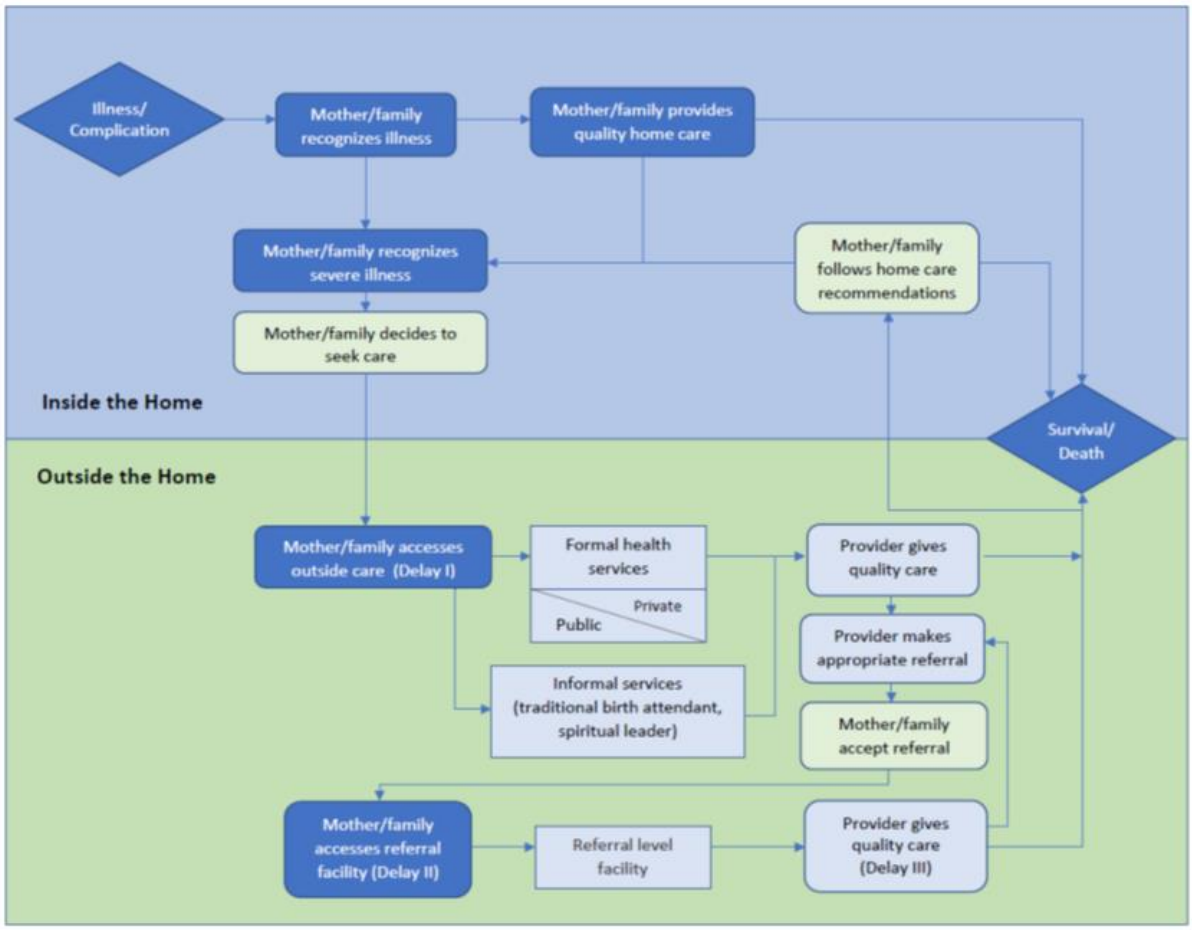
2.8 DATA ANALYSIS

The main objective of this study is to describe the causes and characteristics of maternal and stillborn, and to illuminate the role of various factors in causal pathways leading to death.

Data from the SA module of the tool was used to explore essential elements of the care-seeking process to identify causal pathways for maternal and stillborn. A tailored Pathway to Survival Framework (Figure 3) [26] was used to structure the analysis of social, cultural, and health system factors affecting the continuum of care using the SA module. We analyzed aggregate and district-level data, exploring socio-economic differences, and describing common and divergent experiences in The Pathway.

The VA module of the tool was used to identify a cause of death (COD) for each study subject using the InSilicoVA computer algorithm [27]. From this step, PRDs can be distinguished from maternal deaths, that is deaths that occurred during pregnancy or within 42 days of termination of pregnancy, irrespective of the cause of death (PRDs) [28], versus deaths that occurred during pregnancy or up to 6 weeks after childbirth that were directly caused by or exacerbated by the pregnancy state or its management but not from accidental or incidental causes (maternal deaths) [28].

FIGURE 3: PATHWAY TO SURVIVAL [29]



Given the desire to retain comparability with previously collected data from Banten, the EMNC analysis plan was based on the analysis plan previously employed there [26]. Descriptive statistics were generated for overall patterns of mortality by district, socio-economic status, demographic, fertility history, health services utilization, birth and death characteristics.

3 RESULTS

3.1 MATERNAL DEATHS (JEMBER ONLY)

3.1.1 IDENTIFICATION OF MATERNAL DEATHS THROUGH MADE-IN/MADE-FOR

3.1.1.1 MATERNAL DEATH CAPTURED BY INFORMANTS

In total, we identified 211 possible maternal deaths in Jember through the MADE-IN process. Results of the MADE-FOR interviews with families of the maternal death cases are presented in Table 1. About half of the cases were eligible according to our inclusion criteria (52.1 percent). Among the eligible cases, 93.6 percent of interviews were completed, some were refused (4.5 percent), and a few were partially completed but confirmed as eligible (1.8 percent). Among partially complete and refused cases, eligibility was also confirmed.

TABLE 1: INTERVIEW RESULTS OF MATERNAL DEATHS

INTERVIEW RESULTS (N=211)	%
Eligible (110)	**52.1**
Completed	93.6
Refused	4.5
Partially completed with confirmation	1.8
Ineligible	**47.9**

Among the 101 ineligible maternal death cases, we identified almost half (45 percent) that were not either pregnant or postpartum at the time of death; 32 percent died more than 42 days after childbirth, ten percent were cases that occurred more than two years ago, and 12 percent were duplicate cases.

TABLE 2: REASONS FOR INELIGIBILITY OF MATERNAL DEATHS (N=101)

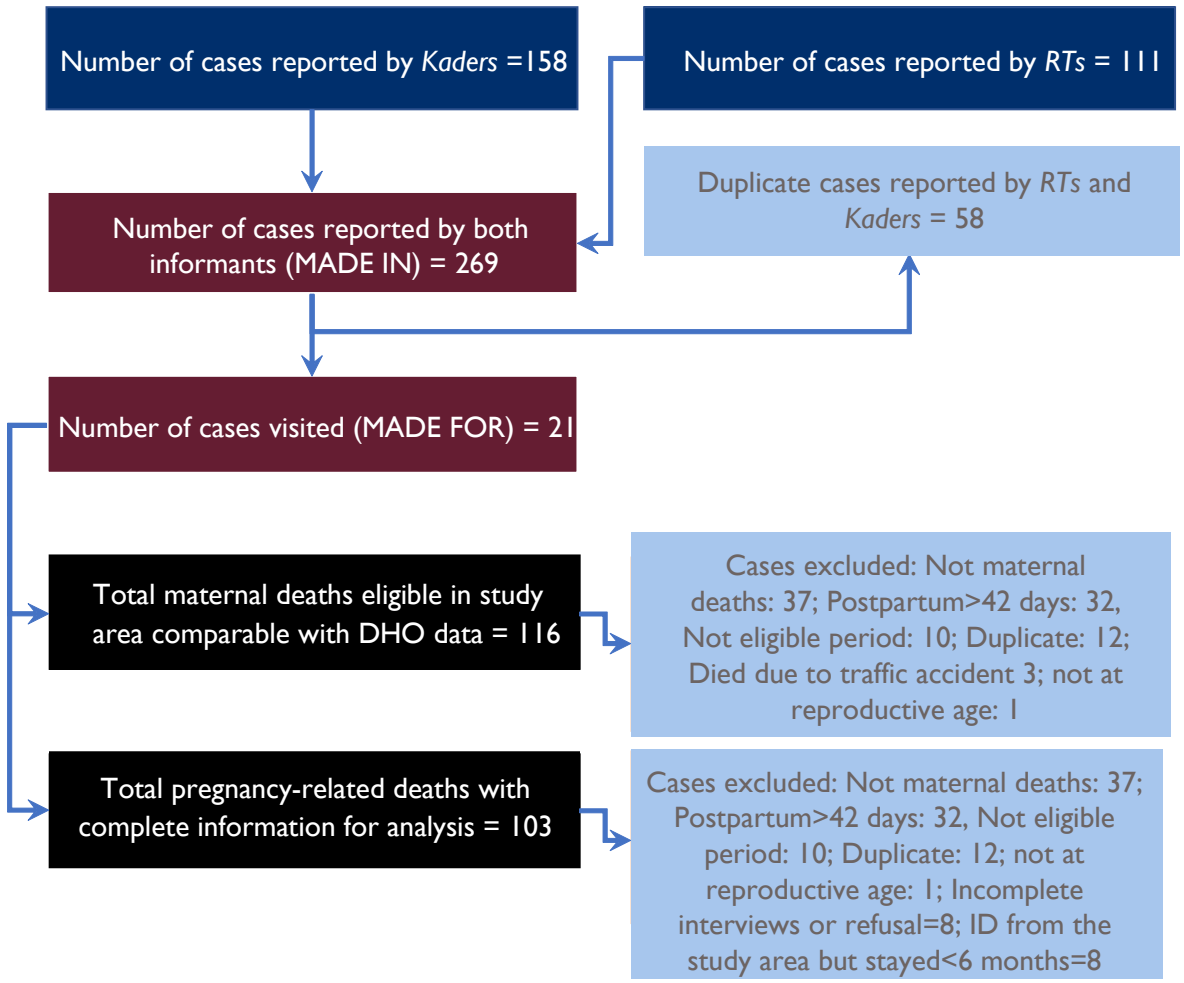
REASONS FOR NOT ELIGIBLE	%
Woman was not pregnant or postpartum at time of death	44.5
Woman's age outside of age range (< 13 or > 49)	1.0
Maternal death occurred > 2 years ago	9.9
Postpartum death occurred > 42 days after childbirth	31.7
Duplicate case of death	11.9
Partially complete without confirmation of death	1.0

3.1.1.2 MATERNAL DEATHS IDENTIFICATION

Figure 4 shows the MADE-IN MADE-FOR process of identifying eligible maternal deaths. Initially, village informants reported 269 possible maternal deaths (158 deaths were reported by *kaders* and 111 were reported by *RTs*). We matched the cases reported by *kaders* and *RTs* and found 58 duplicate cases. After excluding the duplicate cases, there were 211 cases remaining for confirmation through household visits. Full VASA interviews were completed only for cases that met our inclusion criteria.

In the final analysis, we included all PRDs with complete interviews and who had resided in the district for at least six months prior to death. Of the 211 cases, eight cases with incomplete interviews or who refused to be interviewed were excluded, in addition to eight cases who did not meet the residency requirement. One of the three accidental deaths refused to be interviewed. A final sample of 103 PRD cases remained.

FIGURE 4: FLOW CHART OF MATERNAL DEATH CASES IDENTIFICATION



3.1.1.3 MATERNAL CAPTURE-RECAPTURE ANALYSIS OF VILLAGE INFORMANTS

Capture-recapture (CRC) analysis is a method that is used to estimate the total number of individuals within a population [30]. Using this method, it is also possible to estimate how complete each type of village informant was with regard to identifying deaths in their district by matching the reported maternal deaths between the two informant types and estimating the number of cases missed by both types of informants. The CRC technique is a well-established method to estimate total population parameters from two or more data capture methods [30]. In the estimation, the CRC addresses the fraction of cases that might be missed by each data capture method (i.e., informant type) as the expected number of deaths.

CRC analysis results show that both *kaders* and *RTs* captured 96 percent of the total expected number of maternal deaths in Jember. The *RTs*, who cover a smaller size of population than *kaders*, captured more maternal deaths in both rural and urban areas compared to *kaders*. However, the number of deaths found in rural areas was relatively smaller than in urban areas. Details of the CRC results are presented in Table 3.

TABLE 3: MATERNAL DEATHS CAPTURED BY KADER AND RT

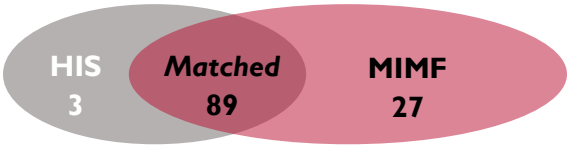
		OVERALL	URBAN	RURAL
		%	%	%
Jember	**Maternal**	96	97	96
	Kader	75	78	67
	RT	85	84	89

3.1.1.4 COMPARISON WITH DHO-HIS DEATHS

One objective of this study was to compare the deaths identified by the EMNC study with the deaths identified by the DHO. To conduct this analysis, a different sample of deaths was necessary because the DHO uses a different definition of maternal deaths than the EMNC study. Specifically, the DHO uses the definition of maternal death, which excludes accidental deaths during pregnancy, childbirth and postpartum, while our study used the pregnancy-related death definition, which includes accidental deaths during pregnancy, childbirth or postpartum. For the purpose of comparing the number of deaths between our study and the DHO's health information system (HIS) report, we used the DHO definition and excluded accidental deaths in our sample. Additional residency and place of death parameters also applied. For comparison with DHO-HIS data, of the 211 MADE-FOR cases, we excluded cases that were not maternal deaths (n=37), died beyond 42 days postpartum (n=32), duplicates (n=12), died outside our study period (n=10), died due to accident (n=3), and the age of death was not within 13-49 years (n=1). As a result, 116 maternal deaths were included in the DHO-HIS comparative analysis.

We matched the cases found in our study (n=116) against the routine HIS report provided by the DHO for the same period (n=92). Eighty-nine cases were reported by both systems. After excluding the duplicates, we found a total of 119 maternal deaths reported by EMNC and the DHO-HIS combined. Of the 119 cases, 77 percent (n=92) were reported by the DHO-HIS and 98 percent (n=116) were included in EMNC study (Figure 5).

FIGURE 5. COMPARISON OF MATERNAL DEATHS IDENTIFIED BY DHO-HIS AND MIMF



To assist the district in improving their routine HIS, we analyzed the characteristics of maternal deaths that were not captured by the HIS but found by our study. The 27 cases that were missed by the DHO-HIS had the following characteristics:

- All cases had an ID card issued in Jember; and thus, should be recorded by the district;
- Usually lived and died in Jember (n=21); usually lived in Jember, but died elsewhere (n=3); usually lived elsewhere but died in Jember (n=3);
- 16 women died at hospitals (11 cases were recorded from hospitals within Jember, and 5 cases died in hospitals outside Jember); six died at home, and three died on-route to a health facility;
- 10 women died during pregnancy and nine died between eight and 42 days postpartum; and

- 14 cases died in the areas of North or East Jember.

3.1.2 CHARACTERISTICS OF MATERNAL DEATHS

This remainder of section 3.1 provides results from the study, including the 103 deaths that met the study's eligibility criteria. These deaths, although pregnancy-related, are referred to as maternal deaths.

Table 4 shows that most respondents were spouses of the deceased (41.7 percent), followed by mothers of the deceased (23.3 percent). The remainder of the respondents were fathers, sisters or other family members. Most of the respondents were aged 30 years or older (86.4 percent). Around half of the respondents had no education or had only completed primary school, and another one-third had attended junior high school.

TABLE 4: CHARACTERISTICS OF RESPONDENTS FOR MATERNAL DEATHS, JEMBER (N=103)

RESPONDENTS CHARACTERISTICS	%
Relationship to the deceased	
Mother	23.3
Father	7.8
Spouse	41.7
Sister	13.6
Other	13.6
Age of Respondent	
< 20 years	2.9
20-24 years	1.0
25-29 years	9.7
≥30 years	86.4
Education	
None or primary	49.5
Junior High	31.1
Senior High	15.5
Academy/University	3.9

When we investigated demographic characteristics of the maternal deaths (Table 5), we found that the percentage of maternal deaths in our sample declined according to age group. One-third of the women died at the age of 35 years or older (34 percent), followed by 30-34 years old (24.3 percent), 25-29 years old (18.4 percent), and 20-24 years old (17.5 percent). Few of them died at 15-19 years old (5.8 percent).

Women in this sample were much less educated than estimates for WRA found in the 2017 IDHS. Forty-two percent of the deceased had no education or had completed primary school. About 26.2 percent completed junior high school. Nineteen percent completed senior high school and only 8.7 percent attended academy/university. Four percent of respondents reported 'don't know' to this question. Almost all of the deceased were married, with the majority of women's age of first marriage was 20 years or older, followed by 16-19 years old (37.9 percent). Nine percent of women were married at less than 16 years of age. The majority of the deceased had two children or less prior to the index pregnancy (83.6 percent), and only a few had three or four children prior to the index pregnancy (16.5 percent).

Data on economic activities (Table 5) show that more than half (57.3 percent) of the deceased were homemakers[1]. A quarter of them were mainly employed in the year prior to death, and 8.7 percent were mainly unemployed (women who had some work but not most of her time). As a comparison, the IDHS reported that 62 percent of currently married women are employed. Among those who were mainly employed, 23.1 percent of them were vendors, 15.4 percent worked in agriculture, 11.5 percent were food stall vendors. Type of occupations included in the 'other' category varied and included teachers, *puskesmas* staff, nurses, tailors, farm workers, and waiters.

TABLE 5: DEMOGRAPHIC CHARACTERISTICS OF MATERNAL DEATHS, JEMBER (N=103)

Characteristics	%
Age of the deceased (years)	
15-19	5.8
20-24	17.5
25-29	18.4
30-34	24.3
35-39	21.4
40+	12.6
Education	
None or Primary	41.7
Junior High	26.2
Senior High	19.4
Academy/University	8.7
Don't know	3.9
Marital status	
Married	98.1
Not married	1.9
Age when first married (years)	
< 16	8.7
16–19	37.9
≥ 20	41.7
Don't know	11.7
Prior births	
0	28.2
1	28.2
2	27.2
3	6.8
4 and more	9.7
Economic activity in the year prior to death	
Mainly unemployed	8.7
Mainly employed	25.2
Homemaker/housewife	57.3
Student/other	8.7

The mean household density among the deceased was 1.6 people per room, which means that, on average, one to two people in the household shared one bedroom. Almost one-third were from each of the second and third wealth quartiles. The mean value of time stayed in the community up to the time of illness was 30.1 years (results not shown).

Most of the households of the deceased lived within 15 minutes from the nearest health facility where they would go for an emergency, with more than one-third living within only five minutes (Table 6).

[1] Homemaker is a person who manages the household of his or her own family, especially as a principal occupation. a person employed to manage a household and do household chores for others

However, we still found women (3.9 percent) who needed to travel around one hour or more to reach the nearest health facility by means of usual transport (mostly by motorcycle). In this case, the nearest health facility can be either midwife clinics, *puskesmas*, or other facilities. However, the instrument did not record the type of facility.

TABLE 6: HOUSEHOLD CHARACTERISTICS (PREGNANCY-RELATED DEATH), JEMBER (N=103)

CHARACTERISTICS	%
Travel time to nearest emergency care	
≤ 5 minutes	35.0
6-10 minutes	28.2
11-15 minutes	13.6
16-30 minutes	18.4
1+ hour	3.9
Don't know	1.0

Analysis on selected health conditions of the deceased shows that the most frequent problem was high blood pressure (30.1 percent), followed by heart disease (9.7 percent), and asthma (7.8 percent). Other health conditions of lower prevalence were liver disease, cancer, chronic obstructive pulmonary disease (COPD), Tuberculosis (TB), and measles. Not all women reported one of the listed prior health conditions, however other conditions may have been present that were not captured by the survey instrument.

TABLE 7: HEALTH CONDITIONS PRIOR TO DEATH OF WOMEN FROM PREGNANCY-RELATED DEATH

HEALTH CONDITIONS PRIOR TO DEATH (N=103)*	%
High blood pressure	30.1
Heart disease	9.7
Asthma	7.8
Liver disease	2.9
Cancer	1.9
COPD	1.9
TB	1.9
Measles	1.0
No listed condition	42.8

*multiple responses are allowed

Table 8 shows that almost all maternal deaths received ANC during pregnancy (92.2 percent). Among those who received ANC, all saw a health provider at least once during pregnancy. About 14 percent also sought care from a TBA or other non-health provider during pregnancy. Village midwives were the most commonly seen health provider for ANC (65.3 percent), followed by *puskesmas* midwives (57.9 percent), private midwives (47.4 percent), and general practitioners/obstetricians (38.9 percent). Almost 80 percent of the mothers had four or more ANC visits. Furthermore, when examining ANC by trimester, we found that 77.9 percent of the deceased had an ANC visit in the first trimester, 83.2 percent had an ANC visit in the second trimester, and 74.7 percent had an ANC visit in the third trimester. The Indonesian government recommends that ANC be received during pregnancy in the sequence of 1,1,2, which means that a woman attend at least one ANC visit during the first trimester, one visit during the second trimester, and two visits during the third trimester. When analyzed by this

algorithm among women who reached the ninth month of pregnancy, just 69.8 percent of women met this recommendation. The study also found that, among women who spent money for ANC, the median expense was 40,000 IDR (equal to ± 2.50 USD).

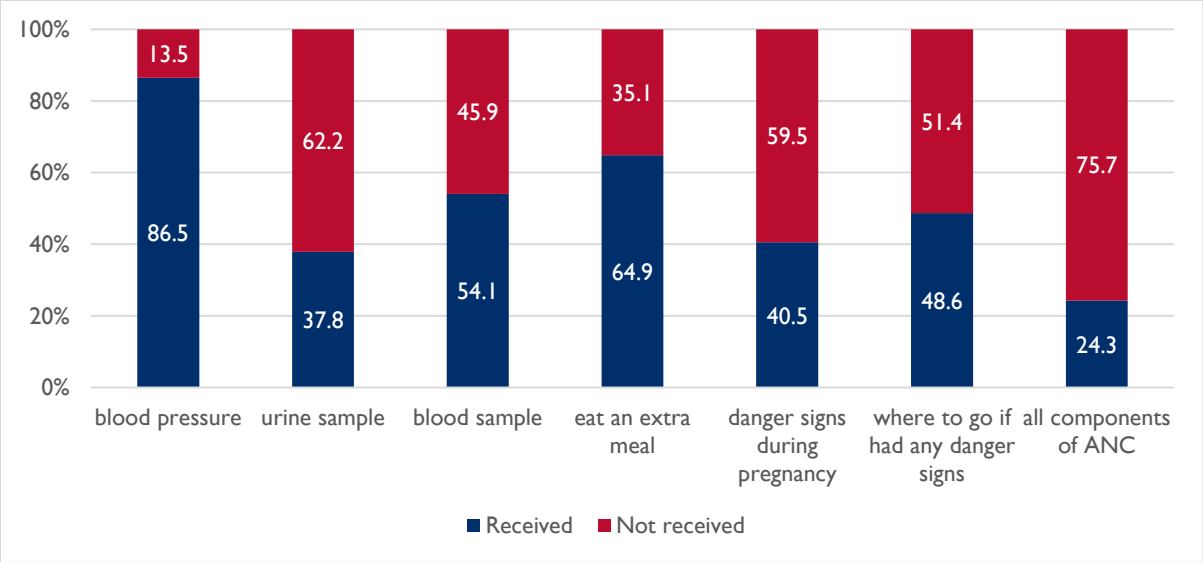
TABLE 8: ANC AMONG MATERNAL DEATHS

CHARACTERISTICS	%
ANC visit(s) (n=103)	
Received ANC	92.2
Type of ANC providers (n=95)	
ANC by health providers	100.0
Traditional Birth Attendants	13.7
Health provider seen during ANC visits (n=95)	
Village midwife	65.3
Puskesmas midwife	57.9
Private midwife	47.4
Unspecified midwife	1.1
General practitioner/obstetrician*	38.9
Nurse	1.1
Midwife in hospital	5.3
Other health provider (specify)	1.1
Number of ANC visits (n=95)	
1-3 times	13.7
4 or more	78.9
Don't know	7.4
Had at least one ANC visit by trimester (n=95)	
First trimester	77.9
Second trimester	83.2
Third trimester	74.7
Had 4 ANC visits - sequence of 1, 1, 2 of those with gestational age ≥ 9 months (n=53)	69.8
Had expense for ANC (n=95)	37.9
Median of out of pocket expenses in rupiah for last ANC visit (n=29)	40,000

* The category in the instrument does not differentiate between general practitioner and obstetrician

We analyzed ANC components received by women who had four or more ANC visits and with the recommended sequence (i.e. at least four visits, at least once during both the first and second trimesters, and at least twice during the third trimester noted as ANC 1,1,2 or K4). The patterns of ANC component graphs indicate that, although the majority of the deceased had ANC visits, the proportion who received all ANC components was low (Figure 6). Among those who followed the 1,1,2 sequence, most had a blood pressure measurement (86.5 percent), followed by received counselling on an extra meal daily (64.9 percent), blood sample taken (54.1 percent), and received information about where to go if they experienced any danger signs (48.6 percent). Just one-quarter of the deceased received all components of ANC. A higher percentage of women who followed the 1,1,2 program received blood and urine tests compared with women who received four or more visits (without following the 1,1,2 sequence). The remaining results for women with four or more ANC visits were similar to women who followed the 1,1,2 sequence recommendation (see Appendix Figure 2).

FIGURE 6. RECEIVED ANC COMPONENTS AMONG MATERNAL DEATHS WITH 4 ANC VISITS (1-1-2 SEQUENCE) *



* for gestational age ≥ 9 months

3.1.3 COMPLICATIONS AND CARE SEEKING

We investigated the complications experienced by the deceased during pregnancy or labor/delivery, and their care seeking, as presented in the following tables. About 15 percent of the deceased had pre-eclampsia at any time during pregnancy or labor/delivery (Table 9), which is within the range of maternal deaths in low- and middle-income countries that are associated with pre-eclampsia and eclampsia (10-15 percent) [31]. Almost one-third of the deceased had high blood pressure during pregnancy, followed by antepartum hemorrhage, convulsions, and blurred vision. Prolonged labor and intrapartum hemorrhage were each experienced by around 23 percent of the deceased during labor/delivery. The numbers in Table 9 do not add up to 100 percent because not all women had a complication.

TABLE 9: MATERNAL COMPLICATIONS: DURING PREGNANCY OR LABOR/DELIVERY

COMPLICATIONS	%
Any time during pregnancy or labor/delivery (n=103)	
Pre-eclampsia/eclampsia	19.4
Maternal infection	4.9
Malaria	1.0
During pregnancy (n=103)	
High blood pressure	27.2
Antepartum hemorrhage	8.7
Convulsion	7.8
Blurred vision	5.8
During labor/delivery (n=75)	
Prolonged labor	22.7
Intrapartum hemorrhage	22.7
Postpartum hemorrhage	30.7

We did not identify cases with severe anemia. However, 45 percent of the cases were reported as looking pale or having pale palms, eyes or nail beds, and 42 percent of those who were treated by formal care received or needed blood transfusion during their fatal illness.

More than half of the deceased gave birth within six hours after the labor began (Table 10). About one quarter of them had a relatively short duration of labor (zero to two hours) but a total of 21.4 percent had prolonged labor (labor duration of 12 hours or more). Most of the deceased delivered by normal vaginal delivery and nearly one-third had a Caesarean-section (C-section). It is notable that more than two thirds (68 percent) of women who died, died during labor of less than 12 hours duration. While data do not permit further investigation, it may be that some of the durations of labor may not have been perceived accurately.

TABLE 10: LABOR/DELIVERY COMPLICATIONS FOR MATERNAL DEATHS, AMONG WOMEN WHO DIED DURING LABOR OR POSTPARTUM

CHARACTERISTICS (N=75)	%
Labor duration (hours)	
0-2	25.3
3-6	29.3
7-11	13.3
12-23	14.7
24-47	4.0
48+	2.7
NA	6.7
Don't know	4.0
Mode of delivery	
Vaginal without forceps or vacuum	**56.0**
C-section	30.7
Vaginal with forceps or vacuum	2.7
NA-baby not delivered	9.3
Don't know	1.3

Stratification by socio-economic status (SES), calculated using the principal components technique usually applied to create demographic and health survey wealth indices as in Demographic and Health Surveys, is shown in Table 11. This suggests that in each quartile there was a higher proportion of normal vaginal delivery compared to other mode of deliveries. Around one-third of the cases were delivered through c-section, with the highest proportion among Quartile 1 and Quartile 3 (50.0 percent).

TABLE 11: MATERNAL MODE OF DELIVERY BY SES*

	SES				
CHARACTERISTICS	Q1 (POOREST)	Q2	Q3	Q4 (RICHEST)	TOTAL
Mode of delivery	**n=16** %	**n=16** %	**n=16** %	**n=27** %	**n=75** %
Vaginal without forceps or vacuum	50.0	62.5	43.8	63.0	56.0
Vaginal with forceps or vacuum	0.0	12.5	0.0	0.0	2.7
C-section	50.0	12.5	50.0	18.5	30.7
NA-baby not delivered	0.0	12.5	6.3	14.8	9.3
Don't know	0.0	0.0	0.0	3.7	1.3

*the wealth index is a composite of household's possessions of fixed line or mobile phone, motorized vehicle, electricity, hazardous cooking fuel, improved water source, and improved sanitation.

Table 12 shows that among the cases who died during labor and delivery (n=75), a majority of the deceased delivered at a hospital or other health facility with a doctor (44 percent) or midwife (36 percent). Around 11 percent of the cases were delivered at home, which is lower than the national average of 16 percent [32]. Most deliveries were assisted by a skilled birth attendant (SBA) at a health facility (85.7 percent).

TABLE 12: DELIVERY CARE FOR MATERNAL DEATHS

CHARACTERISTICS	%
Place of delivery (n=75)	
Hospital	68.0
Other health facility	13.3
Home	10.7
En route to hospital or facility	1.3
Other	6.7
Birth attendant (n=75)	
Doctor	44.0
Midwife	36.0
Nurse	1.3
Relative	1.3
Self (the mother)	4.0
Traditional birth attendant	1.3
Skilled birth attendant (n=70)	
SBA at home	2.9
SBA at facility	85.7
Non-SBA	10
Don't know	1.4

Table 13 shows the place of delivery and type of birth attendant by wealth quartile. These variables do not show clear trends by wealth quintile.

TABLE 13: DELIVERY CARE FOR MATERNAL DEATHS BY SES

	SES				TOTAL
CHARACTERISTICS	Q1	Q2	Q3	Q4	
Place of delivery	**n=16** %	**n=16** %	**n=16** %	**n=27** %	**n=75** %
Hospital	81.3	50.0	87.5	59.3	68.0
Other health facility	18.8	12.5	6.3	14.8	13.3
Home	0.0	31.3	0.0	11.1	10.7
En route to hospital or facility	0.0	6.3	0.0	0.0	1.3
Other	0.0	0.0	6.3	14.8	6.7
Birth attendant	**n=16** %	**n=16** %	**n=16** %	**n=27** %	**n=75** %
Doctor	56.3	25.0	56.3	40.7	44.0
Midwife	43.8	37.5	31.3	33.3	36.0
Nurse	0.0	0.0	6.3	0.0	1.3
Relative	0.0	6.3	0.0	0.0	1.3
Self (the mother)	0.0	0.0	0.0	11.1	4.0
Traditional birth attendant	0.0	6.3	0.0	0.0	1.3
Other	0.0	12.5	6.3	11.1	8.0
Don’t know	0.0	12.5	0.0	3.7	4.0
Skilled birth attendant	**n=16** %	**n=16** %	**n=15** %	**n=23** %	**n=70** %

CHARACTERISTICS	SES				TOTAL
	Q1	Q2	Q3	Q4	
SBA at home	0.0	12.5	0.0	0.0	2.9
SBA at facility	100.0	56.3	100.0	87.0	85.7
Non-SBA	0.0	25.0	0.0	13.0	10.0
Don't know	0.0	6.3	0.0	0.0	1.4

Table 14 shows place of death by place of delivery. Results show that around 82 percent of the deceased who gave birth at hospital also died at a hospital. Sixty percent of those who gave birth at other health facilities also died at a hospital. Of the total maternal deaths, 75 percent occurred in hospital.

TABLE 14: PLACE OF DELIVERY AND PLACE OF DEATH

PLACE OF DEATH	PLACE OF DELIVERY					
	HOSPITAL	OTHER HEALTH FACILITY	HOME	EN ROUTE TO HOSPITAL OR FACILITY	NOT DELIVERED	TOTAL
	N=51 %	N=10 %	N=8 %	N=1 %	N=33 %	N=103 %
Hospital	82.4	60.0	62.5	0.0	72.7	74.8
Other health facility	2.0	10.0	0.0	0.0	15.2	6.8
Home	7.8	10.0	37.5	0.0	6.1	9.7
En route to hospital or facility	7.8	20.0	0.0	100.0	6.1	8.7

About three-quarters of maternal deaths occurred in hospitals, of which about 90 percent received their last care in public and 10 percent in a private hospital (Table 15).

TABLE 15: COMPARISON BETWEEN LAST PROVIDERS AND PLACE OF DEATH, JEMBER

PLACE OF DEATH	LAST PROVIDER						
	PUBLIC HOSPITAL	PUSKESMAS	PRIVATE HOSPITAL	CLINIC	MIDWIFE	OTHER	HOME
Hospital (n=77)	89.6 %	0.0%	10.4%	0.0%	0.0%	0.0%	0.0%
Other health facility (n=7)	0.0%	42.9%	0.0%	28.6%	0.0%	28.6%	0.0%
Home (n=10)	10.0%	0.0%	0.0%	0.0%	20.0%	0.0%	70.0%
En route to hospital (n=9)	44.4%	44.4%	0.0%	11.1%	0.0%	0.0%	0.0%
Total (n=103)	71.8%	6.8%	7.8%	2.9%	1.9%	1.9%	6.8%

Thirty-six percent of maternal death cases died at delivery or within 24 hours postpartum (see Figure 7). Table 16 describes the time of death among those who gave birth at the health facility (which excludes a total of 33 maternal deaths that occurred during pregnancy). Most maternal death cases died during the first 24 hours postpartum and the time of death varied greatly between women who gave birth in a formal setting (e.g., hospital or other health facility) compared with those who did not. Among the 8.6 percent of deaths that occurred during delivery, 4.9 percent labored at a health facility and 33.3 percent labored outside of a hospital or other health facility. Another 44.4 percent of women who labored outside of a hospital or health facility died during the first 24 hours postpartum. About 36 percent of the deceased who gave birth at health facility (either a hospital or other health facility), died during the first

24 hours after delivery or within eight to 42 days postpartum. Analysis of those who delivered at a hospital (Appendix Table 5) showed a similar pattern. Although there is no significant difference (p=0.081; Fisher's exact), the difference between time of death and place of birth is striking in this small sample, especially for death at the time of delivery.

TABLE 16: BIRTH AT FACILITY (HOSPITAL OR OTHER HEALTH FACILITIES) BY TIME OF DEATH

	BIRTH AT HOSPITAL OR OTHER HEALTH FACILITIES			
	YES	NO	TOTAL	
TIME OF DEATH	N=61 %	N=9 %	N=70 %	P VALUE
At delivery	4.9	33.3	8.6	0.081
First 24 hr postpartum	36.1	44.4	37.1	
Day 2 postpartum	3.3	0.0	2.9	
3-7 days postpartum	19.7	11.1	18.6	
8-42 days postpartum	36.1	11.1	32.9	

Table 17 shows that most of the deceased sought health care from formal providers prior to death (98 percent). The decision to seek care was mostly made by the deceased's partner/spouse (47.9 percent) or someone else (32.3 percent). We also asked about constraints faced by the deceased when seeking care. Among the 14 women who were reported as having constraints in seeking care, more than one-third of them had felt too sick to travel to a provider. Another constraint mentioned by many respondents was a dissatisfaction with the available health care (21.4 percent).

When asked about factors influencing the choice of the first provider, most of the deceased's families expressed that proximity was the most prominent factor. More than half of them chose a provider nearby. Habit was the second reason for choosing a care provider, followed by feeling safe, convenience, recommendation from doctor/midwife, and medical reason(s).

TABLE 17: FACTORS RELATED TO CARE SEEKING FOR FIRST PROVIDER

CHARACTERISTICS	%
Sought care # n=98	
Formal care	98.0
Informal care	26.5
Decision maker for care-seeking n=96	
Adult deceased herself	9.4
Adult deceased's partner/spouse	47.9
Both deceased and her spouse	8.3
Someone else	32.3
Don't know	2.1
Constraints to care-seeking n=14	
Too sick to travel	35.7
Not satisfied with available healthcare	21.4
Did not think she was sick enough	7.1
Too much time from her/caregiver's duties	7.1
Too far to travel	7.1
Cost (transport, healthcare, other)	7.1
Other issue	21.4
Factors influencing choice of first provider # n=96	
Provider nearby	56.3
Habit	21.9
Feel safe	15.6
Recommended by doctor/midwife	12.5
Comfortable	11.5

CHARACTERISTICS	%
Medical reason (abnormality)	10.4
Modern services	7.3
Few choices	5.2
Cheap provider	4.2
Family reason	3.1
Other	8.3

#multiple answers are allowed

Table 18 shows factors related to care seeking by wealth quartiles. In each wealth quartile, over 95 percent of the women sought care from a formal provider. However, use of informal care was particularly high in quartile three. Decisions related to care seeking were mostly made by the deceased's partner/spouse among households in quartiles two to four, with the highest proportion among households in quartile three (65 percent). Results show that in the poorest families—households in quartile 1—a high percentage of the decisions were made by someone other than the deceased and/or her spouse (42.1 percent). When asked about factors influencing the choice of first provider, the deceased families responded that distance (provider nearby), habit and feeling safe were the top three reasons for households in each quartile.

TABLE 18: MATERNAL FACTORS RELATED TO CARE SEEKING FOR FIRST PROVIDER BY SES

	SES				TOTAL
CHARACTERISTICS	Q1	Q2	Q3	Q4	
Sought care	**n=19** %	**n=22** %	**n=21** %	**n=36** %	**n=98** %
Formal care	100.0	100.0	95.2	97.2	98.0
Informal care*	26.3	31.8	42.9	13.9	26.5
Decision maker for care-seeking	**n=19** %	**n=22** %	**n=20** %	**n=35** %	**n=96** %
Adult deceased herself	5.3	4.5	10.0	14.3	9.4
Adult deceased's partner/spouse	31.6	45.5	65.0	48.6	47.9
Both deceased and her spouse	15.8	18.2	0.0	2.9	8.3
Someone else	42.1	31.8	20.0	34.3	32.3
Don't know	5.3	0.0	5.0	0.0	2.1
Factors influencing choice of first provider	**n=19** %	**n=22** %	**n=20** %	**n=35** %	**n=96** %
Cheap provider	0.0	4.5	0.0	8.6	4.2
Provider nearby	47.4	59.1	55.0	60.0	56.3
Feel safe	21.1	27.3	20.0	2.9	15.6
Comfortable	10.5	13.6	15.0	8.6	11.5
Modern services	10.5	9.1	10.0	2.9	7.3
Habit	26.3	13.6	30.0	20.0	21.9
Family reason	0.0	0.0	0.0	8.6	3.1
Few choices	0.0	4.5	5.0	8.6	5.2
Medical reason (abnormality)	21.1	4.5	5.0	11.4	10.4
Recommended by doctor/midwife	10.5	13.6	10.0	14.3	12.5
Other	5.3	13.6	10.0	5.7	8.3

* Informal care: pharmacy/drug seller, home care, and traditional care

Once the women reached the first provider, most were referred (65.9 percent). Of those who were referred, 93.3 percent left the first facility alive. Transportation was arranged prior to referral in half of the cases, and of those who left the facility alive, most of the deceased were taken to all the places they were referred.

Only 15 respondents stated that they had concerns about the referral the deceased had received. The main concerns were the cost of healthcare (26.7 percent), that they thought the deceased would die despite receiving care (20 percent), and other reasons (20 percent), such as the woman being worried about getting a c-section and concerns about a potential delay for the newborn. Most of the families knew why the deceased was referred (92.9 percent) with the main reason for referral from the first provider being that the necessary equipment was not available (78.8 percent). Given that 84.5 percent of the deceased women were covered under some form of health insurance (see below Table 24) concerns about healthcare costs may seem incongruous. However, insurance may not necessarily cover all the healthcare needed and, in the moment, families may not have been certain of their benefits and entitlements.

TABLE 19: SUMMARY OF REFERRALS FOR MATERNAL DEATHS

Characteristics	%
Among those who reached formal care n=91	
Woman referred from first provider	65.9
	n=60
Woman left the first facility alive	93.3
Woman died prior leaving facility	6.7
Among those who left the first facility alive n=56	
Took woman to all places referred	96.4
Transportation was arranged	50.0
Had concerns regarding the referral	26.8
Concerns about referral n=15	
Cost of healthcare	26.7
Thought she will die despite care	20.0
Thought no more care needed	6.7
Too much time from caregiver's duties	6.7
Someone else decided	6.7
Too far to travel	6.7
Went to a different provider/facility	6.7
Not satisfied with available care	6.7
Thought she was too sick to travel	6.7
Other	20.0
Provider or facility that referred the cases n=56	
Puskesmas	57.1
Private doctor/clinic	10.7
Trained nurse or midwife (outside a health facility for public sector)	7.1
Private hospital	7.1
Trained community health worker, nurse or midwife (outside a health facility for private medical sector)	7.1
Government hospital	3.6
Government health post	1.8
Other private medical sector	5.4
	n=56
Knew why they were referred	92.9
Reasons for referral from first provider* n=52	
Necessary equipment not available	78.8
Necessary procedure not available	25.0
Trained provider not available	25.0
Necessary medicines not available	21.2
No bed available	1.9
Other reasons	13.5

*multiple answers are allowed

3.1.4 POTENTIAL DELAYS DURING CARE-SEEKING

Using the three delays framework, we mapped the care-seeking process to explore whether the deceased experienced any delays during her fatal illness (Table 20). Out of the total 103 maternal deaths cases, 98 women sought care during the fatal illness. Reasons for not seeking care for the remaining five maternal deaths were not specified. Among those who sought care, almost all of them sought formal health care (97.9 percent, 96 out of 98). The two women who did not seek formal care received home care only.

About 14.5 percent (14/96) of the maternal deaths sought informal care first before going to formal care. Amongst the women who primarily sought informal care, there was an average delay of 12.5 hours before deciding to seek formal care. In comparison, women who went to formal care directly had no delays. About 76 percent (73/96) of the deceased went to more than one provider, with a median time of 0.17 hours since deciding to seek formal care until reaching the first formal provider (i.e., second delay) – significantly different from the median time among those who went to one provider (p=0.036).

Our study did not collect information about delay three, which is the delay in receiving adequate healthcare. The third delay indicates problems in quality of care in health facilities. Some limited information on community-reported quality of care was collected during the study, but we were unable to collect objective measures of quality of care at the facility level. Thus, we created a proxy for delay three by assessing whether the cases that had reached a PONEK hospital (i.e. a hospital with capacity to provide comprehensive emergency obstetric care) at any time during their fatal illness were referred to another health facility.

If referral from a PONEK hospital occurred, we infer that the PONEK hospital, which should have had the capacity to manage all emergencies, could not provide adequate care, thus reflecting a problem with the quality of care. We found that nearly 10 percent of the cases (7/73) were referred from one PONEK to another PONEK hospital. In addition, about 67 percent (49/73) of the deceased went through other provider(s) before reaching the PONEK, which would have contributed to delay three.

TABLE 20: SUMMARY OF DELAY IN HEALTH CARE SEEKING, JEMBER

CHARACTERISTIC	YES	NO	TOTAL	TIME FROM SYMPTOM RECOGNITION UNTIL DECIDING TO SEEK CARE (MEDIAN)	TIME FROM DECIDING TO SEEK CARE UNTIL REACHING THE FIRST PROVIDER (MEDIAN)
Sought health care (n=98)	96	2	98		
Who did not seek formal care					
Provided home care only	2	0	2		
Sought traditional care only	0	0	0		
First delay (n=96)					
All who sought formal care				0.02 hr	
Sought informal care first[¥]	14	82	96	12.5 hr	
Sought formal care first	82	14	96	0.00 hr	
Second delay (n= 96)					
All who sought formal care					0.17 hr
Went to one provider	23	73	96		0.00 hr[α]
Went to more than one provider	73	23	96		0.17 hr[α]
Went to other provider/s before *PONEK*	49	24	73		

Proxy of third delay[◊] (n=73)
All who received care from at least one *PONEK hospital*

Went from *PONEK* to *PONEK*	7	66	73		

Note: Table excludes five women who did not seek any type of care.
[¥]Informal care includes home care, traditional care and care from a pharmacist/drug seller
[◊]Delay three could not be assessed from the tool used in EMNC study. However, cases who reached *PONEK* hospital and were referred elsewhere indicate that even *PONEK* hospital could not provide adequate care.
[α]Wilcoxon rank-sum (Mann Whitney) non-parametric test p=0.036

3.1.5 CAUSE OF DEATH

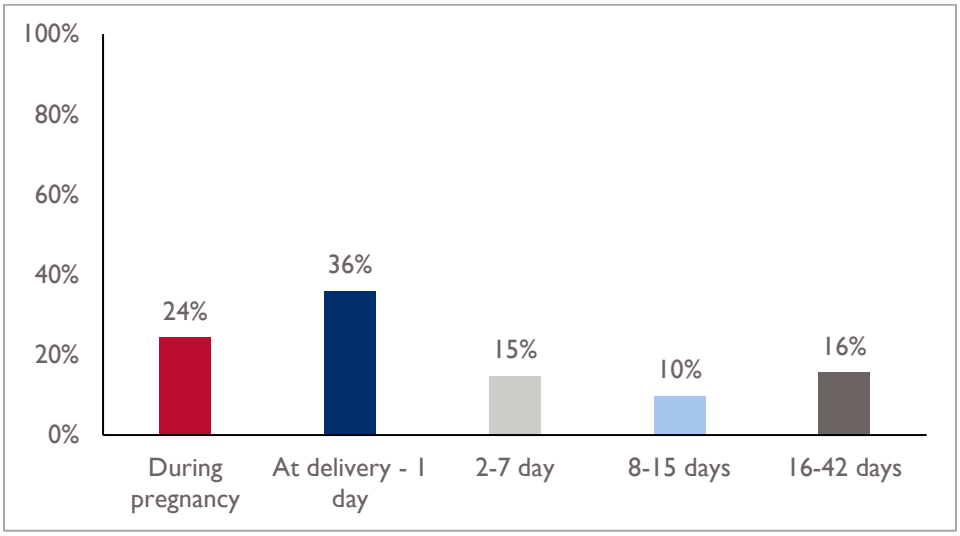
Analysis of the causes of pregnancy-related deaths was conducted using InSilicoVA software. Compared to other VA tools, InSilicoVA attempts to account for and represent uncertainty; InSilicoVA does not generate what are so called 'undetermined' causes that are typically difficult to interpret. The InSilicoVA uses cause-specific mortality fractions to inform the assignment of individual causes of death. Table 21 shows that the five major causes of pregnancy-related deaths were obstetric hemorrhage (29.7 percent), pregnancy-related sepsis (18.1 percent), pregnancy-induced hypertension (16.6 percent), other and unspecified cardiac disease (8.8 percent), and ruptured uterus (5.2 percent).

TABLE 21: FIVE LEADING CAUSES OF PREGNANCY-RELATED DEATHS USING INSILICOVA

CAUSE OF PREGNANCY RELATED DEATH	PERCENTAGE (RANGE)
Obstetric hemorrhage	29.7 (21.0-40.0)
Pregnancy-related sepsis	18.1 (10.7-26.5)
Pregnancy-induced hypertension	16.4 (9.5-24.2)
Other and unspecified cardiac disease	8.8 (3.6-15.3)
Ruptured uterus	5.2 (1.3-10.9)

Other 21.6%: acute respiratory infection including pneumonia, other and unspecified maternal CO, abortion-related death, anemia of pregnancy, and breast neoplasms

FIGURE 7: TIME OF MATERNAL DEATH IN JEMBER 2017-2018



The proportion of deaths by the period of death is presented in Figure 7 and is broken out by causes of death in Table 22. Thirty-six percent of deaths occurred during labor or delivery and the first day after delivery, of which the majority were caused by bleeding. Around 15 percent of maternal deaths that occurred during days two through seven postpartum were mainly caused by bleeding and post-pregnancy sepsis. Almost one-quarter of deaths occurred during pregnancy before the onset of labor.

Unlike the causes of death during labor and the first 24 hours postpartum, deaths during pregnancy were mostly caused by hypertension in pregnancy and sepsis. Another 10 percent of deaths occurred during days eight to 15 postpartum, and half of them were caused by indirect obstetric causes such as heart diseases, lung diseases and malignancy. Of the remaining 16 percent of cases that died 16-42 days postpartum, the main cause of death was post-pregnancy sepsis.

TABLE 22: FIVE LEADING CAUSES OF PREGNANCY-RELATED DEATHS BY TIME OF DEATH

	TIME OF DEATH					
CAUSE OF PREGNANCY RELATED DEATH	DURING PREGNANCY N=25 %	AT DELIVERY – 1 DAY N=37 %	2-7 DAYS N=15 %	8-15 DAYS N=10 %	16-42 DAYS N=16 %	TOTAL N=103 %
Obstetric hemorrhage	4.0	64.9	26.7	0.0	18.8	31.1
Other and unspecified cardiac disease	12.0	8.1	6.7	20.0	6.3	9.7
Pregnancy-induced hypertension	24.0	10.8	20.0	10.0	12.5	15.5
Pregnancy-related sepsis	32.0	2.7	26.7	20.0	31.3	19.4
Ruptured uterus	0.0	13.5	13.3	0.0	0.0	6.8
Other*	28.0	0.0	6.7	50.0	31.5	17.6

*Other causes: abortion, accidental exposure to smoke fire & flames, acute cardiac disease, acute respiratory infection including pneumonia, anemia of pregnancy, breast neoplasm, diarrheal diseases, digestive neoplasm, liver cirrhosis, other & unspecified NCD, other & unspecified maternal COD, road traffic accident

Table 23 below presents the cause of maternal death by place of delivery among women who died during delivery or within 24 hours of postpartum. Among this group, half of the women who died due to obstetric hemorrhage delivered in a hospital. This finding indicates that, even though hemorrhage is among the leading causes of maternal deaths, hospitals still face problems in its management. Another 20.8 percent of the deceased who died from hemorrhage gave birth in either a *puskesmas* or private midwife clinic, which may indicate a problem with referral of those cases to a higher level of care. This may be due to unwillingness on the part of the family to move the woman to another facility, or a failure to recognize danger signs promptly enough to effect timely referral.

TABLE 23: CAUSES OF DEATH BY PLACE OF DELIVERY AMONG WOMEN WHO DIED DURING DELIVERY OR WITHIN 1 DAY POSTPARTUM

	PLACE OF DELIVERY					
CAUSE OF PREGNANCY RELATED DEATH	HOSPITAL %	PUSKESMAS %	PRIVATE MIDWIFE CLINIC %	HOME %	EN ROUTE TO FACILITY %	UNKNOWN* %
Obstetric hemorrhage (n=24)	50.0	12.5	8.3	16.7	4.2	8.3
Ruptured uterus (n=5)	40.0	0.0	0.0	0.0	0.0	60.0
Pregnancy-induced hypertension (n=4)	50.0	25.0	0.0	25.0	0.0	0.0
Other and unspecified cardiac disease (n=3)	100.0	0.0	0.0	0.0	0.0	0.0
Pregnancy-related sepsis (n=1)	0.0	0.0	0.0	100.0	0.0	0.0

*unknown refers to women who died in labor but before delivery

Among women who died during the postpartum period (in this case, within two to 42 days after childbirth), and sought care from formal providers, most went directly to a *puskesmas* (29.7 percent), public hospital (21.6 percent), or private hospital (13.5 percent). About 19 percent of them sought or received their first care from midwives outside of health facilities (mostly at home) (see Appendix Table

7). This raises concerns about the capacity of health providers in recognizing and managing postpartum complications.

We analyzed the causes of death among maternal deaths that occurred within two to 42 days postpartum by the type of first provider. About half of those who died from pregnancy-related sepsis sought care from a public or private hospital or *puskesmas*. Another one-third, however, sought care from midwives outside of health facilities, most likely at home. Similarly, about one-third of women who died from pregnancy-induced hypertension also sought care from midwives outside of health facilities. These results may suggest that fever and symptoms related to increased blood pressure were not recognized as serious danger signs that should have led families to seek care at a health facility or for midwives to refer to a health facility. See appendix Table 7.

Further analysis was done on causes of death by the type of last provider among maternal deaths that occurred within two to 42 days postpartum and who sought care from more than one provider (n=27). Most of those cases received/sought their last care from a hospital, primarily public hospitals, regardless of the causes of death. However, for pregnancy-related sepsis, 14.3 percent of cases received care from a midwife outside of health facilities. See appendix Table 8.

3.1.6 INSURANCE FOR MATERNAL DEATHS

The district is on its way to reaching Universal Health Coverage as part of the National Health Insurance (NHI) program that commenced in 2014. However, this study found that around 16 percent of the maternal death cases did not have any health insurance (Table 24). Approximately one-third of the deceased had the *JKN Penerima Bantuan Iuran (PBI)* type of NHI insurance (individual insurance for which the premium is paid by the government), and another one-third paid their health expenditures out of pocket despite being covered by insurance.

Among cases who sought care at the time of their fatal illness, over half did not use any insurance when they sought care from the first health facility prior to death (55.2 percent). A quarter of them used *JKN Penerima Bantuan Iuran - Anggaran Pendapatan Belanja Negara (PBI-APBN)*, followed by *Jamkesda/JKN PBI - Anggaran Pendapatan Belanja Daerah (PBI-APBD)* or insurance covered by the local government budget (10.4 percent). Among women who went to more than one provider, more women utilized health insurance when they reached the last provider; only around a quarter of them did not use any health insurance. Around one-third of those cases used *JKN PBI-APBN* (37.7 percent), followed by *Jamkesda/PBI-APBD* (18.8 percent), *JKN Peserta Bukan Penerima Upah/PBPU* (14.5 percent) and only a few used company insurance.

TABLE 24: INSURANCE COVERAGE

Insurance*	%
Mother's health insurance (n=103)	
None	15.5
JKN Penerima Bantuan Iuran - Anggaran Pendapatan Belanja Negara (PBI-APBN)	35.9
JKN Peserta Bukan Penerima Upah/PBPU	15.5
Jamkesda/JKN PBI - Anggaran Pendapatan Belanja Daerah (PBI-APBD)	19.4
Jampersal	1.9
Self-paid (combination of having insurance and self-payment)	33.0
Company	1.9
Method of payment when seeking care at first provider, among those who sought formal care (n=96)	
Out of pocket	55.2
JKN PBI-APBN	25.0

JKN-PBPU	7.3
Jamkesda/PBI-APBD	10.4
Company	2.1
Method of payment when seeking care at last provider, among those who sought formal care from more than one provider (n=69)	
Out of pocket	24.6
JKN PBI-APBN	37.7
JKN-PBPU	14.5
Jamkesda/PBI-APBD	18.8
Company	2.9

*Multiple answers are allowed

We analyzed the use of insurance for women who delivered by c-section (Table 25). It appears that the coverage of insurance among those cases who delivered by c-section was similar to those cases who did not delivery by c-section (87 percent and 82.5 percent respectively). Among those who delivered by c-section, 40 percent had *JKN PBI-APBN*, and 35 percent had co-payment in addition to their insurance.

TABLE 25: MATERNAL C-SECTION BY INSURANCE COVERAGE

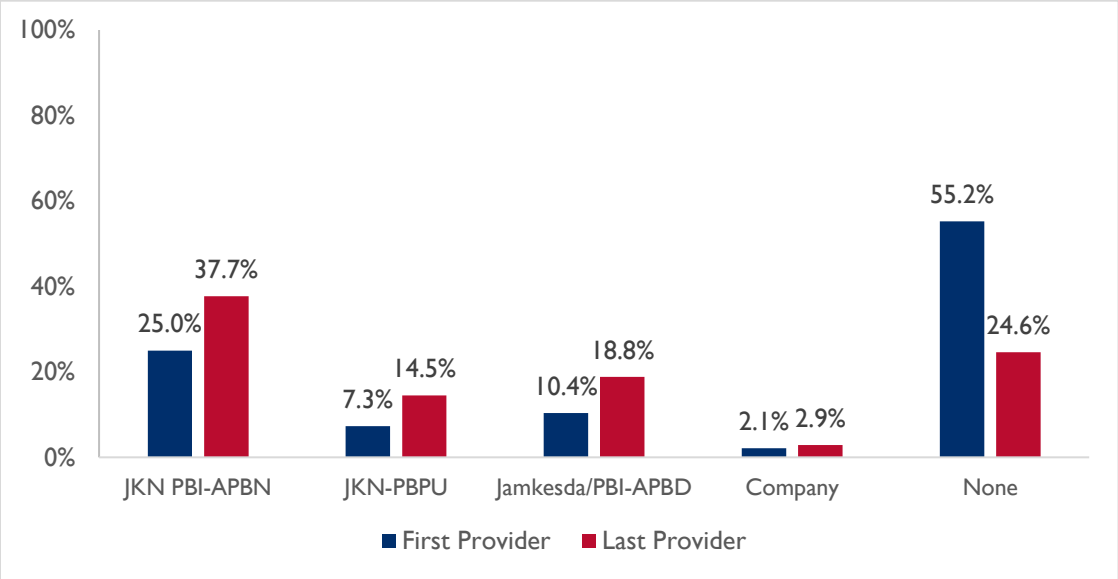
	C-SECTION		
	YES	NO	TOTAL
INSURANCE	N=23 %	N=80 %	N=103 %
Any insurance	87.0	82.5	83.5
No insurance	13.0	17.5	16.5
Type of Insurance	n=20 %	n=66 %	n=86 %
JKN-PBPU	25.0	12.1	15.1
PBI-APBN	40.0	43.9	43.0
JKN Peserta Penerima Upah (PPU)	0.0	0.0	0.0
Jamkesda/PBI-APBD	25.0	22.7	23.3
Jampersal	5.0	1.5	2.3
Self-paid	35.0	40.9	39.5
Company	5.0	1.5	2.3

We investigated coverage of maternal insurance at each time of death (Table 26). More cases of those who died during pregnancy had insurance compared to other categories time of death. Of cases who died during postpartum, cases of 16-42 days had the lowest insurance coverage (6.3 percent).

TABLE 26: COVERAGE OF MATERNAL INSURANCE BY TIME OF DEATH

	INSURANCE COVERAGE		
	YES	NO	TOTAL
TIME OF DEATH	%	%	%
During pregnancy (n=25)	24.0	76.0	100.0
At delivery - 1 day after delivery (n=37)	16.2	83.8	100.0
2 - 7 days (n=15)	20.0	80.0	100.0
8 - 15 days (n=10)	10.0	90.0	100.0
16 - 42 days (n=16)	6.3	93.8	100.0

FIGURE 8: MATERNAL INSURANCE AT FIRST AND LAST PROVIDER



We also conducted a comparison on the use of insurance at the first and last provider during fatal illness, as seen in the above figure. It was found that the percentage of the use of any type of insurance increased in the last provider, while the percentage of those who did not use any insurance decreased in the last provider.

3.2 NEONATAL DEATHS

3.2.1 IDENTIFICATION OF NEONATAL DEATHS THROUGH NODE-IN/NODE-FOR

3.2.1.1 NEONATAL DEATHS CAPTURED BY INFORMANTS

In total, we conducted interviews with the families of 902 identified possible neonatal deaths in Serang and Jember. Of the total 902 cases visited, 30.2 percent (272/902) were eligible according to our inclusion criteria (118 cases in Serang and 154 cases in Jember). Among the eligible cases (n=272), almost all had complete interviews (95.2 percent). Only a small number of cases were partially completed or refused, but we confirmed that those cases were eligible. In both study districts the numbers of eligible and ineligible cases were similar.

It is important to bear in mind that the maternal and neonatal arms of the EMNC study were independent: they represent two entirely separate samples of deaths. Therefore, results from the neonatal section will not be consistent with those reported above in the maternal section.

TABLE 27: INTERVIEW RESULTS OF NEONATAL DEATHS BY DISTRICT

INTERVIEW RESULTS	SERANG N=335 %	JEMBER N=567 %	TOTAL N=902 %
Eligible	n=118	n=154	n=272*
Completed	92.4	97.4	95.2
Refused	2.5	1.9	2.2
Partially completed with confirmation	5.1	0.6	2.6
Ineligible	n=217	n=413	n=630*

*p value= 0.011 between eligible and ineligible

For all ineligible cases (n=630), we recorded the reasons for ineligibility, as presented in Table 28. The main reason for ineligibility was stillbirth (56.2 percent in Serang and 37.5 percent in Jember), followed by deaths that occurred outside the study period (25.8 percent in Serang and 34.4 percent in Jember). Other reasons were gestational age less than 28 weeks (13.4 percent in Serang and 15.7 percent in Jember), died at the age of more than 27 days, miscarriage/abortion, neonates were not delivered, duplicate cases, and incomplete interviews without confirmation whether the deaths were eligible.

The high number of cases excluded due to stillbirth was anticipated. Because we were aware of the potential misclassifications between stillbirth and live birth, we asked *kaders* and *RTs* to record both stillbirth and live births, and we then verified the cases with the households. Furthermore, when *kaders* or *RTs* were not fully certain whether a case was eligible for inclusion into the study we encouraged *kaders* and *RTs* to capture the case, and cross checked the cases with the families of the deceased. The reason was to minimize any potential for missing cases.

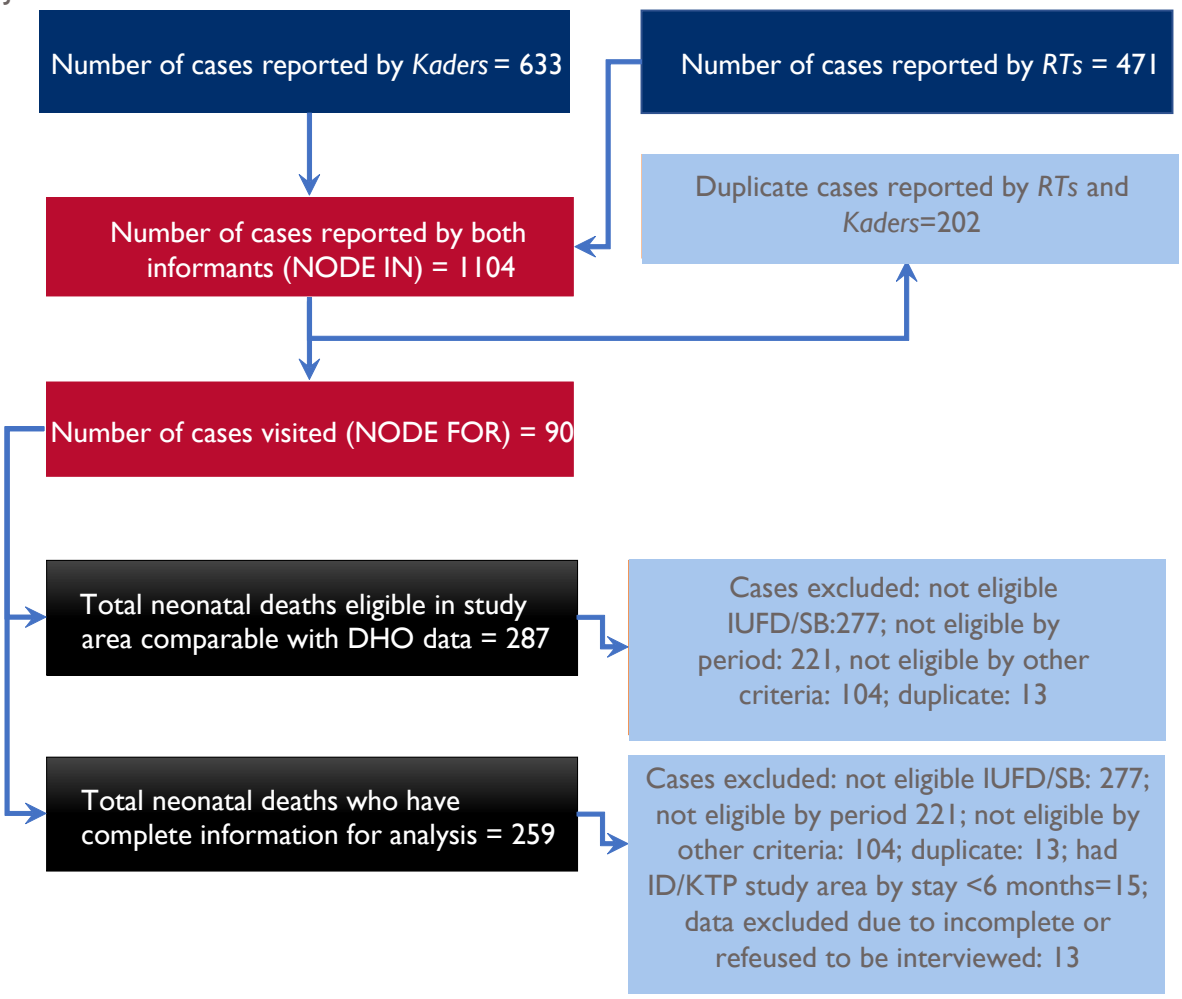
TABLE 28: REASONS FOR INELIGIBILITY OF NEONATAL DEATHS

REASONS FOR NOT ELIGIBLE	SERANG N=217 %	JEMBER N=407 %	TOTAL N=624 %
Stillbirth	56.2	37.5	44.0
Neonates died outside the study period	25.8	34.4	31.4
Gestational age <7 months (28 weeks)	13.4	15.7	14.9
Age of neonate >27 days at time of death	2.8	3.4	3.2
Miscarriage	0.5	4.4	3.0
Neonate was not delivered	0.9	0.5	0.6
Duplicate case of death	0.5	2.9	2.1
Incomplete interviews without confirmation of eligibility	0.0	1.2	0.8

The following flowchart provides details of the case identification in this study. Initially, we identified a total of 1,104 possible neonatal deaths reported by the village informants (631 were reported by *kaders* and 471 deaths were reported by *RTs*, Figure 9). We matched the cases reported by *kaders* and those reported by *RTs* and excluded duplicates. There was a total of 902 individual cases, after excluding the duplicates. We visited the households of the 902 cases to verify cases eligibility, and to conduct full VASA interview if the cases were eligible. Out of the 902 cases, only 287 were eligible. We excluded stillbirths (n=277); died outside our study period (n=221); ineligible due to other criteria (n=104), such as age of death beyond 27 days; and duplicates (n=13).

The 287 eligible cases were then matched with DHO's HIS data to compare the capture of neonatal deaths between our study and the HIS. For the purpose of the analysis, one of our inclusion criteria is that the parents of the neonates should have been living in the study area for at least six months prior to neonatal death (considered as residents). Therefore, the total number of eligible cases was 272; excluding 15 neonates whose parents had identification issued in the study district but had stayed for less than six months in the district. For the final descriptive analysis of the cases, out of the 272 cases, we excluded 13 cases with incomplete interviews or refusals. A total of 259 cases remained for the final analysis.

FIGURE 9: FLOW CHART OF NEONATAL DEATH CASES IDENTIFICATION OF SERANG AND JEMBER



3.2.1.2 NEONATAL CAPTURE-RECAPTURE ANALYSIS OF VILLAGE INFORMANTS

Table 29 shows that based on the neonatal CRC analysis, *RTs* reported more cases than *kaders*. *RTs* captured about 80-81 percent of neonatal deaths in both districts, while *kaders* captured 63 percent of the cases in Serang and 53 percent of the cases in Jember. The finding that shows *RTs* reported more neonatal deaths than *kaders* was similar for urban and rural areas.

TABLE 29: NEONATAL DEATHS CAPTURED BY *KADER* AND *RT*

		OVERALL	URBAN	RURAL
		%	%	%
Serang	**Neonate**	93	95	85
	Kader	63	66	55
	RT	80	84	67
Jember	**Neonate**	91	94	78
	Kader	53	54	47
	RT	81	87	58

3.2.1.3 COMPARISON OF NEONATAL DEATHS CAPTURED BY DHO-HIS AND NODE-IN/NODE-FOR

COMPARISON OF NEONATAL DEATHS BETWEEN OUR STUDY AND DHO'S HIS OF JEMBER DISTRICT

From Jember DHO's HIS report, we identified 85 neonatal deaths that met our study criteria, while the EMNC study found 161 neonatal deaths. We matched the cases reported in the HIS against our study. Fifty-nine cases were reported by the two data sources as eligible neonatal deaths, and thus the total number of neonatal deaths captured by both systems was 187 in total. This means that the DHO's HIS report missed 102 cases found by our study, and our study missed 26 cases that were recorded in the HIS report. Thus, the DHO's HIS captured 45 percent (n=85) while the EMNC study captured 86 percent (n=161) of all neonatal deaths identified in the district during our study period.

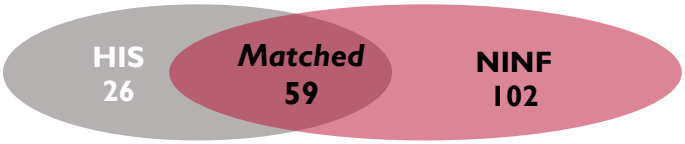
From the 102 cases missed by the HIS, eight were actually recorded by the HIS but as stillbirths. Thus, there were 94 cases that were not recorded by the HIS report.

Characteristics of the 94 cases that were completely missed by the HIS are as follows:

- 93 had the parents' ID card issued in Jember and were usual residents of Jember; 1 had the parents' ID issued in Jember but usually lived elsewhere;
- 56 died in hospitals (46 died in hospitals in Jember, 10 died in hospitals outside Jember); eight died in primary healthcare facilities, 26 died at home, and three died en route;
- 37 died at less than one day of age, 34 died at one to six days of age, and the remaining died at seven days or older.

Thirteen of the 26 cases not captured by this study were identified. However, interviews confirmed that the cases were ineligible: five were stillborn, six were less than 28 weeks gestation, one died beyond 27 days of age, and one was not delivered. Thus, only 13 cases were completely missed.

FIGURE 10. COMPARISON OF NEONATAL DEATHS IDENTIFIED BY DHO-HIS AND NINF, JEMBER



COMPARISON OF NEONATAL DEATHS BETWEEN OUR STUDY AND DHO'S HIS OF SERANG DISTRICT

From Serang DHO's HIS report, we identified 89 neonatal deaths that meet our study criteria. We matched those cases against the neonatal deaths found by our study (n=126). Using our eligibility criteria, we found that only 66 cases were found in both data sources as eligible neonatal deaths. Thus, the total number of neonatal deaths captured by both systems was 148 in total. This means that the DHO's HIS report captured 60 percent (n=89) and EMNC study captured 84 percent (n=126) of the total neonatal deaths identified in the district during the study period (n=148).

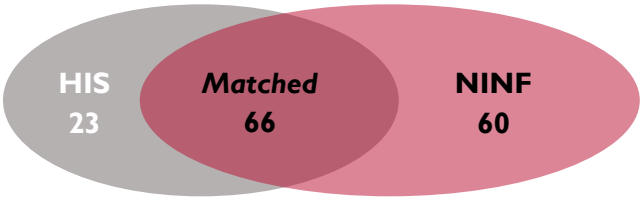
From the 60 cases missed by the HIS, nine were actually recorded but four were recorded as stillbirths or IUFD and five were neonates born at <28 weeks gestation. Thus, there were 51 cases that were not found anywhere in the HIS report.

Characteristics of the 51 cases missed by the HIS are as follows:

- 28 died in hospitals (11 died in hospitals in Serang, 10 died at the provincial hospital, and seven died in hospitals outside Serang); five died in primary healthcare facilities, 15 died at home, and one died en route; and
- 10 died at less than one day of age, 26 died at one to six days of age, and the remaining cases died at seven days or older.

From the 23 cases that were not captured by our study, 12 were actually identified but were ineligible (four cases were IUFD/stillbirths, six cases had gestational age <28 weeks, and two case died beyond 27 days of age). Thus, only 11 cases were completely missed by our study.

FIGURE 11: COMPARISON OF NEONATAL DEATHS IDENTIFIED BY DHO-HIS AND NINF, SERANG



The next sections describe results of the descriptive analyses of the socio-demographic characteristics, complications and care seeking. The analyses only include cases with complete data (n=259).

3.2.2 CHARACTERISTICS OF NEONATAL DEATHS

Both in Serang and Jember, most of the respondents (Table 30) were mothers of the neonates (63.3 percent and 87.3 percent, respectively), followed by fathers (24.8 percent and 6.7 percent, respectively). The rest of the respondents were grandmothers or other family members. Most respondents were more than 30 years old, and only few were under 20 years old. Around one-third of the respondents did not attend school or only completed primary school, and another one-third attended junior high school. About one-quarter of them attended senior high school, and only a few completed academy/university.

TABLE 30: RESPONDENTS' CHARACTERISTICS

RESPONDENTS CHARACTERISTICS	SERANG N=109 %	JEMBER N=150 %	TOTAL N=259 %
Relationship to the deceased			
Mother	63.3	87.3	77.2
Grandmother	5.5	3.3	4.2
Father	24.8	6.7	14.3
Other	6.4	2.7	4.2
Age of Respondent			
< 20 years	1.8	12.0	7.7
20-24 years	13.8	22.0	18.5
25-29 years	17.4	18.7	18.1
≥30 years	67.0	47.3	55.6
Education			
None or primary	33.9	36.0	35.1
Junior High	33.0	32.7	32.8

RESPONDENTS CHARACTERISTICS	SERANG N=109 %	JEMBER N=150 %	TOTAL N=259 %
Senior High	30.3	23.3	26.3
Academy/University	2.8	8.0	5.8

In both Serang and Jember, we found that about one-third (34 percent) of neonatal deaths occurred on day 0 (less than 24 hours after birth), while another 44.8 percent occurred within days one and six, and 11.6 percent were within days seven and 13. Most of the neonatal deaths were male (60.6 percent). Nearly one-third of the neonates' mothers were at the age of 35 or older at the time of interview. The proportion of young mothers (15-19 years old) was higher in Jember (14 percent) than in Serang (5.5 percent). This corresponds to the younger age at first marriage in Jember than in Serang. In Serang, more than a half of mothers married at the age 20 years or older, while in Jember, more than half of the mothers married at the age of younger than 20.

About one-third of the mothers of the deceased neonates in both districts did not attend school or only completed primary school, another one-third completed junior high school, 27 percent completed senior high school, and only few of them completed academy or university. The fathers' education level appears to be slightly lower than the mothers' education. This finding was consistent across the two districts. About 43 percent of the fathers did not attend school or only completed primary schools.

By regions (Table 31), we found that more than a half of the neonatal deaths occurred in rural area (51.4 percent) and few of them occurred in remote areas (4.2 percent). However, the proportion of neonatal deaths in rural and remote areas was much higher in Serang compared to Jember. This finding is likely due to the fact that Serang district is predominantly rural (70 percent), while Jember has relatively equal proportion of urban and rural areas. A more detailed analysis indicates disparity across areas within Jember district. Nearly half of the neonatal deaths were found in North Jember (48 percent), followed by the South area (21.3 percent). Only a few cases were found in the West area (5.3 percent). North Jember is the most populous area and comprises more rural than urban areas.

TABLE 31: DEMOGRAPHIC CHARACTERISTICS OF NEONATAL DEATHS

NEONATAL CHARACTERISTICS	SERANG N=109 %	JEMBER N=150 %	TOTAL N=259 %	P VALUE
Age of neonates at time of death (days)				
0	31.2	36.0	34.0	0.628
1-6	48.6	42.0	44.8	
7-13	11.9	11.3	11.6	
14-20	5.5	4.7	5.0	
21-27	2.8	6.0	4.6	
Gender of neonates				
Male	60.6	60.7	60.6	0.985
Female	39.4	39.3	39.4	
Mother's characteristics of the neonatal deceased				
Age (years)				
15-19	5.5	14.0	10.4	0.035*
20-24	21.1	24.7	23.2	
25-29	17.4	20.0	18.9	
30-34	18.3	19.3	18.9	
≥ 35	37.6	22.0	28.6	

NEONATAL CHARACTERISTICS	SERANG N=109 %	JEMBER N=150 %	TOTAL N=259 %	P VALUE
Education				
None or Primary	33.0	34.7	34.0	0.310
Junior High	34.9	32.0	33.2	
Senior High	29.4	25.3	27.0	
Academy/University	2.8	8.0	5.8	
Age when first married (years)				
<16	6.4	8.0	7.3	0.163
16-19	37.6	50.0	44.8	
≥20	54.1	40.0	45.9	
Don't know	1.8	2.0	1.9	
Paternal education				
None or Primary	41.3	44.7	43.2	0.602
Junior High	23.9	22.7	23.2	
Senior High	31.2	26.0	28.2	
Academy/University	3.7	6.7	5.4	
Area				
Urban	`	48.7	44.4	0.013*μ
Rural	53.2	50.0	51.4	
Remote	8.3	1.3	4.2	
Jember Area				
South		21.3		
East		11.3		
Central		14.0		
West		5.3		
North		48.0		

*Significantly different.

μ Result of this test need to be interpreted cautiously due to different characteristic of two districts.

Households of the deceased neonates in Serang had a mean density of 1.8 people per room, while the density in Jember was 1.6 people per room. On average, households of the deceased neonates in Jember had been continuously living in the community for about 37 years, while households in Serang have stayed in the community for about 24 years (data not shown).

The majority of the deceased neonates' households in Serang and Jember had been living within less than five minutes of the nearest health facilities used in an emergency (75.3 percent and 84 percent, respectively). The proportion of travel time of more than 15 minutes to nearest health facilities was 24.8 percent in Serang and 16.0 percent in Jember.

For each neonatal death, we asked whether or not a death certificate was issued. Almost all of the deceased neonates in both districts were not issued a death certificate. In Serang and Jember, only 7.3 percent and 1.3 percent of the deceased neonates had death certificates, respectively.

Most of the mothers of the deceased neonates saw health personnel for ANC during pregnancy (97.7 percent). However, many mothers still saw traditional birth attendants (28.3 percent); the proportion was far higher in Serang (42.2 percent) than in Jember (18.1 percent). The type of health providers seen during ANC was mostly village midwife (64.3 percent), followed by *puskesmas* midwife (57.9 percent), private midwife (55.6 percent), and general practitioner/obstetrician (39.3 percent). In addition, almost all (89.3 percent) of the deceased neonates' mothers had four of more ANC visits. Most of the mothers had an ANC visit in each trimester (1, 2 and 3). However, not all women had the minimum

recommended ANC in the 1,1,2 sequence. The proportion was substantially lower in Serang (66.7 percent) than in Jember (81.1 percent).

Almost half of the deceased's mothers received two doses of tetanus toxoid either during the previous pregnancy or the recent pregnancy. The proportion of mothers receiving the vaccine was higher in Serang (63.9 percent) than in Jember (35.4 percent). Forty six percent of the mothers spent money for ANC visits with the median out of pocket expenses of IDR 50.000 across both districts (IDR 60.000 in Serang and IDR 40.000 in Jember). Statistical differences in ANC visit determinants between Serang and Jember are the following: 1) care through a traditional birth attendant, 2) attendance with unspecified health providers, ANC 4 or more visits, number of ANC visits in the third trimester, and receipt of two doses of tetanus toxoid vaccines.

TABLE 32: ANTENATAL CARE OF NEONATAL DEATH

CHARACTERISTICS	SERANG	JEMBER	TOTAL	P VALUE
Provider seen during ANC visits [2]	**n=109** %	**n=149**[3] %	**n=258** %	
Health providers *(desegregated below)*	99.1	96.6	97.7	0.199
Traditional Birth Attendants	42.2	18.1	28.3	0.000*
Health provider seen during ANC visits	**n=108** %	**n=144** %	**n=252** %	
Village midwife	61.1	66.7	64.3	0.362
Puskesmas midwife	51.9	62.5	57.9	0.090
Private midwife	57.4	54.2	55.6	0.608
General practitioner/obstetrician	32.4	44.4	39.3	0.053
Unspecified midwife	4.6	0.7	2.4	0.043*
Nurse	0.0	0.7	0.4	0.386
Midwife in hospital	0.9	2.1	1.6	0.467
Unspecified health provider	13.0	0.7	6.0	0.000*
Number of ANC visits	**n=108** %	**n=144** %	**n=252** %	
1-3	14.8	6.3	9.9	0.077
4 or more	84.3	93.1	89.3	
Don't know	0.9	0.7	0.8	
ANC by trimester	**n=108** %	**n=144** %	**n=252** %	
First trimester	75.0	81.9	79.0	0.181
Second trimester	96.3	98.6	97.6	0.233
Third trimester	81.5	92.4	87.7	0.009*
	n=109 %	**n=150** %	**n=259** %	
Received any ANC from formal provider	99.1	96.0	97.3	0.131
	n=108 %	**n=144** %	**n=252** %	
Had 4 or more ANC visits by health provider	84.3	93.1	89.3	0.025*
	n=48 %	**n=90** %	**n=138** %	
Had 4 ANC visits - sequence of 1, 1, 2 of those with gestational age ≥ 9 months	66.7	81.1	76.1	0.058
	n=108 %	**n=144** %	**n=252** %	
Mother received tetanus toxoid vaccine	63.9	35.4	47.6	0.000*
	n=108	**n=144**	**n=252**	

[2] As women attended more than one ANC visits.

[3] Among 150 neonatal deaths in Jember, mother of one neonate did not have ANC during the pregnancy

CHARACTERISTICS	SERANG	JEMBER	TOTAL	P VALUE
	%	%	%	
Had expense for ANC	52.8	40.3	45.6	0.108
	n=56 %	**n=57** %	**n=113** %	
Median of out of pocket expenses for last ANC visit (in IDR/Indonesian Rupiah)	60.000	40.000	50.000	-

For each neonate, we asked whether the mother received any of the six components of ANC. Figure 12 and 13 present the proportion of each component among neonates' mothers who had full term pregnancy and received the recommended ANC visits with the 1,1,2 sequence (explanation of '1,1,2' has been provided in the maternal section). We focused on the three examinations that could help detect risk of eclampsia and anemia in pregnant women, i.e. blood pressure, urine sample, and blood sample assessments. Those two complications increase the risk of maternal deaths and poor neonatal outcomes. Figure 12 and 13 describe in more detail the proportion of each ANC component received in each district. In both districts, the three components that were most commonly received were measurement of blood pressure, counselling to eat an extra meal, and blood sample examination. The figures show that all mothers received blood pressure measurement during ANC. The least received component was urine sample examination (25 percent in Serang and 52.1 percent in Jember). However, the proportions of urine and blood sample examination were better in Jember than in Serang. Similarly, the proportion of neonates' mothers who received all of the six components was also better in Jember (26 percent) compared to Serang (12.5 percent).

We also assessed the receipt of each ANC component for different sub-groups, i.e. those who had any ANC regardless of the frequency, and those who had four or more ANC visits regardless of the frequency in each trimester (Figures 4-8 are presented in the appendix). Findings were similar and showed that the three most commonly received components were measurement of blood pressure, counselling to eat an extra meal, and blood sample examination, while the least received component was urine sample. The performance of the ANC (1,1,2) program is slightly better than ANC visits four times or more in terms of blood and urine test (see also Figure 6-8 in the appendix). Jember District is better than Serang District.

FIGURE 12: RECEIVED ANC COMPONENTS OF THOSE WITH 4 ANC VISITS (SEQUENCE OF 1-1-2) – NEONATES, SERANG*

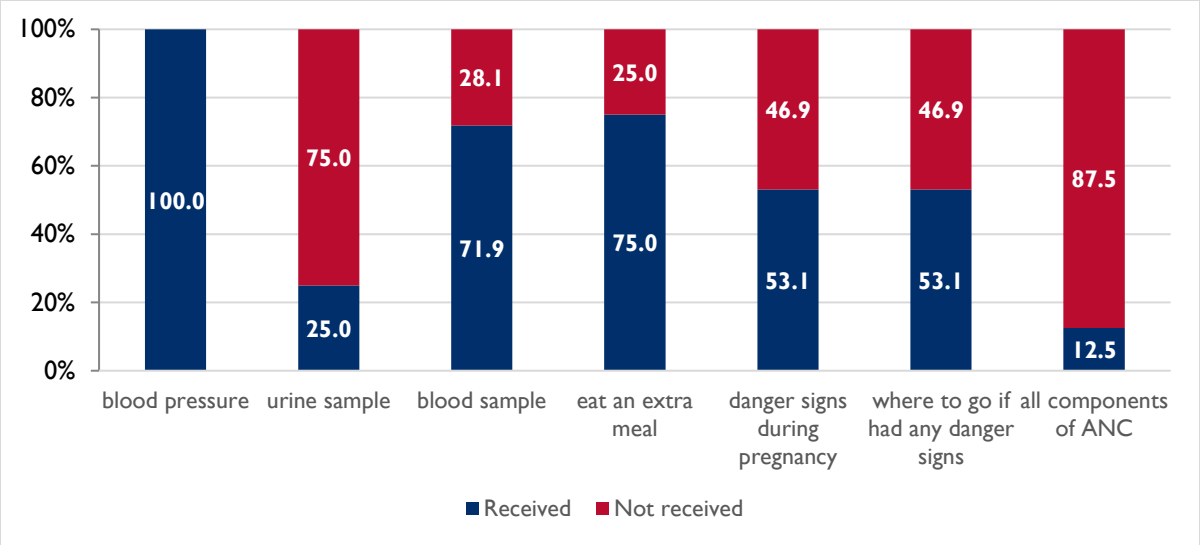
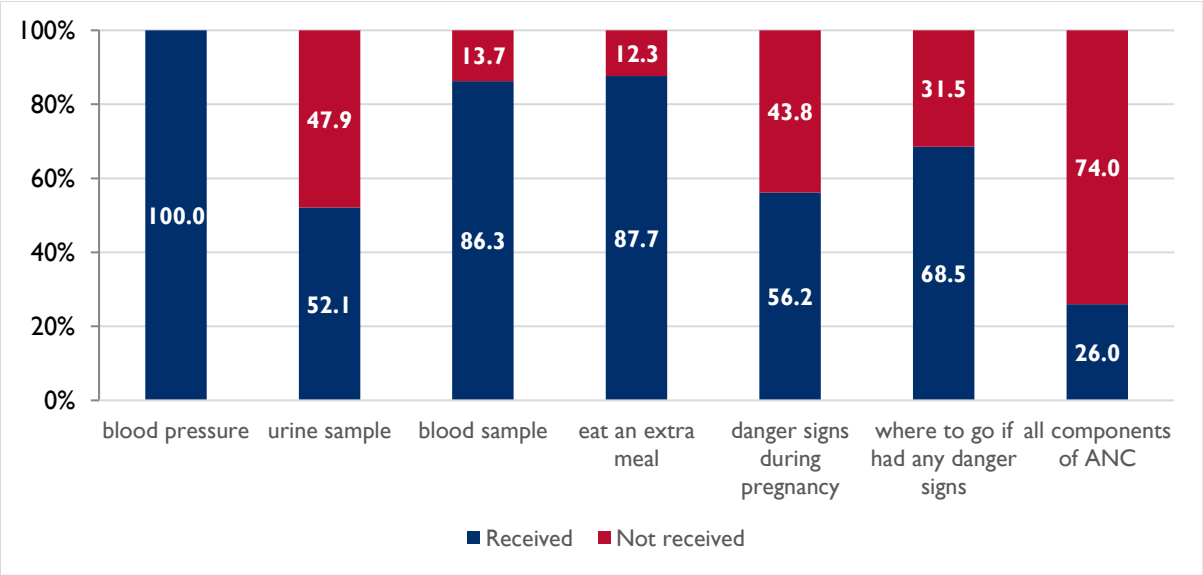


FIGURE 13: RECEIVED ANC COMPONENTS OF THOSE WITH 4 ANC VISITS (SEQUENCE OF 1-1-2) – NEONATES, JEMBER*



3.2.3 COMPLICATION AND CARE SEEKING

3.2.3.1 MATERNAL COMPLICATION AND CARE SEEKING

Table 33 shows complications that the neonates' mothers experienced during pregnancy. The top three complications were high blood pressure (12.7 percent), blurred vision (6.2 percent) and antepartum hemorrhage (5.8 percent). The findings were consistent between Serang and Jember. However, in Jember antepartum hemorrhage was higher (6.7 percent) and ranked as the second highest complication.

Among neonates' mothers who had pregnancy complications and sought care from health providers, the hospital was the most visited facility. In Serang, more women went to hospital (61.9 percent) than in Jember (42.9 percent). Almost half of the mothers went to *puskesmas* (46.4 percent), 32.1 percent went to private clinics, and 28.6 percent went to private practice midwives. The use of private practice midwife care was much lower in Serang (14.3 percent) than in Jember (37.1 percent). Note that many of the women sought care from more than one provider.

TABLE 33: PREGNANCY COMPLICATIONS AND FORMAL CARE SEEKING

	SERANG	JEMBER	TOTAL
Pregnancy complications	**n=109** %	**n=150** %	**n=259** %
High blood pressure	12.8	12.7	12.7
Blurred vision	7.3	5.3	6.2
Ante-partum hemorrhage	4.6	6.7	5.8
Foul smelling discharge	3.7	4.0	3.9
Convulsions	0.0	0.7	0.4
Care-seeking from health provider	**n=21** %	**n=35** %	**n=56** %
Hospital	61.9	42.9	50.0
Puskesmas	42.9	48.6	46.4
Private clinic	38.1	28.6	32.1
Private practice midwife	14.3	37.1	28.6
Health provider seen at the other place	9.5	20.0	16.1
Polindes (midwife, for childbirth)	4.8	8.6	7.1

Table 34 shows that nearly half (46.7 percent) of the neonates' mothers had preterm labor. However, the proportion of preterm labor was higher in Serang (56 percent) than in Jember (40 percent). About one-third of the mothers had prolonged labor (31.3 percent), and the proportion was higher in Jember (34.7 percent) than in Serang (26.6 percent). Eleven percent of the mothers had high blood pressure during labor/delivery; with a higher proportion in Jember (13.3 percent) than in Serang (8.3 percent).

Most of the neonates' mothers (73.7 percent) had spontaneous vaginal delivery, which was consistent between the two districts. The proportion of c-section, however, was substantially higher in Jember (29.3 percent) than in Serang (16.5 percent).

TABLE 34: LABOR/DELIVERY COMPLICATION AND MODE OF DELIVERIES

	SERANG	JEMBER	TOTAL
Labor/delivery complications	**n=109** %	**n=150** %	**n=259** %
Preterm labor (pregnancy less than 9 months)[4]	56.0	40.0	46.7
Prolonged labor (labor 12 hours or more)	26.6	34.7	31.3
High blood pressure	8.3	13.3	11.2
Labor duration (hours)	**n=109** %	**n=150** %	**n=259** %
0-2	31.2	28.7	29.7
3-6	29.4	18.0	22.8
7-11	12.8	18.7	16.2
12-23	21.1	20.7	20.8
24-47	4.6	8.0	6.6

[4] Pregnancy less than 9 months was the definition for pre-term, as it was considered easier to receive information about this than asking about 37 weeks gestational age as this is a population based study

	SERANG	JEMBER	TOTAL
48+	0.9	6.0	3.9
Mode of deliveries	**n=109** %	**n=150** %	**n=259** %
Spontaneous vaginal delivery (without forceps or vacuum)	78.9	70.0	73.7
Assisted vaginal delivery (with forceps or vacuum)	4.6	0.7	2.3
C-section	16.5	29.3	23.9

We analyzed the mode of deliveries by the socio-economic status or wealth quartiles, with Q1 being the poorest and Q4 being the richest (Table 11 in appendix). Our analysis shows that the most common mode of delivery in both Serang and Jember was spontaneous vaginal delivery, consistent across all wealth quartiles. In Serang, the proportions of spontaneous vaginal delivery ranged from 75 percent to 84.6 percent, with the highest among Q4, while in Jember, the highest proportion was among Q2 (81.8 percent). C-section was the second most common mode of delivery both in Serang and Jember. If we look into the proportion in each quartile, the lowest proportion in Serang was among Q4 (3.8 percent), while in the other quartiles it was around 20 percent each. In Jember, about one-third of each of those who were in Q1, Q3 and Q4 had C-sections, followed by Q2 (18.2 percent).

Most deliveries occurred at health facilities, either at hospital (46.3 percent) or other health facilities (36.7 percent). The proportion of deliveries in hospital was higher in Jember (50 percent) than in Serang (41.3 percent). On the other hand, the proportion of home delivery was higher in Serang (19.3 percent) than in Jember (10.7 percent). The proportion of neonates' mothers who did not deliver or did not attempt to deliver with health providers at a health facility was higher in Serang than Jember, 12.8 percent and 3.3 percent, respectively. Overall, the majority of deliveries were assisted by midwives (49.4 percent), followed by general practitioners/obstetricians (32.8 percent). The proportion of deliveries assisted by general practitioners/obstetricians was higher in Jember (39.3 percent) than in Serang (23.9 percent). Deliveries assisted by traditional birth attendant were higher in Serang than in Jember (8.3 percent and 2 percent respectively).

The table below shows that both neonates' fathers and mothers play an important role in making decisions on the place of birth. In Serang, however, more neonates' mothers made the decision on her own (30.3 percent) compared to Jember (20.7 percent). We also asked whether the families faced any constraints in seeking care for deliveries, regardless of whether or not they delivered with a formal care provider or in a health facility. Of those who did not (or did not try to) deliver with a formal provider, the most commonly mentioned constraints in Serang were cost (35.7 percent), too far to travel (28.6 percent), no one available to go with her and no transportation (each 21.4 percent). In Jember, the most common constraints were too far to travel (40 percent), followed by cost, no transportation, too sick to travel, and thought he/she will die despite care (each mentioned by 20 percent of the respondents).

Among neonates' mothers who delivered with, or were en route to, a health provider or facility, 39.1 percent of mothers in Serang mentioned that they had constraints, which is higher than in Jember (24.4 percent). Cost-related constraints were expressed in both Serang and Jember (33.3 percent and 24.2 percent, respectively).

TABLE 35: PLACE OF BIRTH, DELIVERY ATTENDANT, AND DECISION MAKER FOR PLACE OF BIRTH AND CARE-SEEKING CONSTRAINTS

Characteristics	Serang	Jember	Total
Place of birth	**n=109** %	**n=150** %	**n=259** %
Hospital	41.3	50.0	46.3
Other health facility	35.8	37.3	36.7
Home	19.3	10.7	14.3
En route to hospital or facility	3.7	2.0	2.7
	n=109 %	n=150 %	n=259 %
Did not deliver, or did not attempt, to deliver at a formal provider/facility	**12.8**	**3.3**	**7.3**
Birth attendants	**n=109** %	**n=150** %	**n=259** %
Midwives (village midwife, *puskesmas* midwife, private midwife, unspecified midwife)	56.9	44.0	49.4
General practitioner/obstetrician	23.9	39.3	32.8
Traditional birth attendant	8.3	2.0	4.6
Nurse	0.9	2.7	1.9
Relative/friend	0.0	3.3	1.9
Other	0.0	0.7	0.4
No one	10.1	7.3	8.5
Don't know	0.0	0.7	0.4
Decision maker for place of birth	**n=109** %	**n=150** %	**n=259** %
The woman, herself	30.3	20.7	24.7
Her husband/partner	28.4	26.7	27.4
The woman and her husband/partner jointly	20.2	20.7	20.5
The woman's mother	6.4	4.7	5.4
The woman's mother-in-law	0.9	2.7	1.9
The woman's father	0.0	0.7	0.4
Someone else	3.7	0.7	1.9
Health provider	3.7	16.7	11.2
Relative	4.6	0.7	2.3
Precipitous labor	1.8	6.0	4.2
Among those who did not deliver, or did not try to, deliver with a health provider or facility	**n=17** %	**n=15** %	**n=32** %
Care seeking constraints to deliver with a formal provider	82.4	33.3	59.4
Care seeking constraints to deliver with a formal provider* (If she did not, or did not try to, deliver with a health provider or in a facility for delivery)	**n=14** %	**n=5** %	**n=19** %
Too far to travel	28.6	40.0	31.6
Cost	35.7	20.0	31.6
No transportation available	21.4	20.0	21.1
No one available to go with her	21.4	0.0	15.8
Did not think she was sick enough	14.3	0.0	10.5
Was late at night	14.3	0.0	10.5
Too sick to travel	0.0	20.0	5.3
Thought he/she will die despite care	0.0	20.0	5.3
Problem with health insurance	7.1	0.0	5.3
Other issue	21.4	20.0	21.1
Among those who delivered with, or was en route to, a health provider or a facility for delivery	**n=92** %	**n=135** %	**n=227** %
Care seeking constraints to deliver with a formal provider	39.1	24.4	30.4
Issue care seeking constraints to deliver with a formal provider*	**n=36** %	**n=33** %	**n=69** %
Cost	33.3	24.2	29.0
Too far to travel	16.7	6.1	11.6
Problem with health insurance	11.1	3.0	7.2

Characteristics	Serang	Jember	Total
Someone else had to decide	8.3	3.0	5.8
Too sick to travel	5.6	6.1	5.8
Did not think she was sick enough	2.8	6.1	4.3
Thought he/she will die despite care	0.0	9.1	4.3
Not satisfied with available healthcare	2.8	6.1	4.3
No one available to go with her	0.0	6.1	2.9
No transportation available	2.8	0.0	1.4
Other issue	30.6	42.4	36.2

*Multiple answers are allowed

In Serang, the lowest proportion of hospital-based delivery was among the Q4 group (the richest) and the highest was among Q1. However, 11.5 percent of the deceased from Q4 died en route to hospital or other facilities. The proportion of home-based deliveries was high among the middle groups (Q2 and Q3) as opposed to Q1 and Q4. In Jember, however, around half of the deceased in the groups of Q1, Q3 and Q4 were born at hospital. A distinct pattern is seen among Q2, where the proportion of hospital-based deliveries was lower (39.4 percent), and the proportion of home-based deliveries was substantially higher (27.3 percent) compared to other groups.

The proportion of deceased neonates who were born with SBA in health facilities in Serang were similar across all wealth quartiles (ranged from 70.8 percent to 79.2 percent), and the proportion of deliveries with non-SBA was lowest among Q4 (11.5 percent). On the other hand, in Jember, the proportion of deliveries with non-SBA was far higher in Q2 than the other groups.

The most common birth attendants among the deceased from all wealth quartiles in Serang and Jember were midwives and general practitioners. The proportion of deliveries attended by midwives was around half among those who were from Q2 and Q3. The proportion was highest among Q4 (76.9 percent) and lowest among Q1 (41.7 percent). In Jember, the proportion of deliveries that were attended by midwives was quite similar across all wealth quartiles (between 40 percent and 48 percent). In Serang, the proportion of deliveries attended by general practitioners or obstetricians was lowest in Q4 (11.5 percent). The proportion of deliveries with TBA among Q3 in Serang was quite high (16.7 percent). In Jember, the proportion of deliveries attended by general practitioners or obstetricians was lowest in Q2 (18.2 percent).

In Serang, the role of neonates' mothers in making the decision on her own about the place of birth appears to be stronger among Q1 (41.7 percent) than other groups, especially Q4 (19.2 percent). On the other hand, in Jember the proportion of cases in which the mother made the decision on her own was quite similar among Q1, Q2 and Q4 (around 20 percent), slightly higher than Q3 (17.6 percent). The proportion of decision making by husband/partner on his own was around one-third in Q1 and Q3 in Serang. The proportions were relatively similar across all wealth quartiles in Jember.

TABLE 36: PLACE OF BIRTH, DELIVERY ATTENDANT, AND DECISION MAKER FOR PLACE OF BIRTH BY SES

	SERANG					JEMBER					
CHARACTERISTICS	Q1	Q2	Q3	Q4	TOTAL	Q1	Q2	Q3	Q4	TOTAL	TOTAL
Place of birth	**n=24** %	**n=35** %	**n=24** %	**n=26** %	**n=109** %	**n=48** %	**n=33** %	**n=34** %	**n=35** %	**n=150** %	**n=259** %
Hospital	50.0	40.0	45.8	30.8	41.3	50.0	39.4	58.8	51.4	50.0	46.3
Other health facility	37.5	34.3	25.0	46.2	35.8	41.7	30.3	38.2	37.1	37.3	36.7

CHARACTERISTICS	SERANG					JEMBER					TOTAL
	Q1	Q2	Q3	Q4	TOTAL	Q1	Q2	Q3	Q4	TOTAL	
Home	12.5	22.9	29.2	11.5	19.3	4.2	27.3	2.9	11.4	10.7	14.3
En route to hospital or facility	0.0	2.9	0.0	11.5	3.7	4.2	3.0	0.0	0.0	2.0	2.7
Skilled birth attendant	**n=24** %	**n=35** %	**n=24** %	**n=26** %	**n=109** %	**n=48** %	**n=33** %	**n=34** %	**n=35** %	**n=150** %	**n=259** %
SBA at home	0.0	5.7	8.3	15.4	7.3	0.0	3.0	0.0	0.0	0.7	3.5
SBA at facility	79.2	74.3	70.8	73.1	74.3	87.5	69.7	97.1	85.7	85.3	80.7
Non-SBA	20.8	20.0	20.8	11.5	18.3	12.5	27.3	2.9	11.4	13.3	15.4
Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.7	0.4
Birth attendant	**n=24** %	**n=35** %	**n=24** %	**n=26** %	**n=109** %	**n=48** %	**n=33** %	**n=34** %	**n=35** %	**n=150** %	**n=259** %
Midwife*	41.7	54.3	54.2	76.9	56.9	41.7	48.5	47.1	40.0	44.0	49.4
General practitioner/ obstetrician	37.5	22.9	25.0	11.5	23.9	43.8	18.2	50.0	42.9	39.3	32.8
Traditional birth attendant	4.2	8.6	16.7	3.8	8.3	2.1	6.1	0.0	0.0	2.0	4.6
Nurse	0.0	2.9	0.0	0.0	0.9	2.1	6.1	0.0	2.9	2.7	1.9
Relative/friend	0.0	0.0	0.0	0.0	0.0	2.1	6.1	0.0	5.7	3.3	1.9
Other	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.7	0.4
No one	16.7	11.4	4.2	7.7	10.1	6.3	15.2	2.9	5.7	7.3	8.5
Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.7	0.4
Decision maker for place of birth	**n=24** %	**n=35** %	**n=24** %	**n=26** %	**n=109** %	**n=48** %	**n=33** %	**n=34** %	**n=35** %	**n=150** %	**n=259** %
The woman, herself	41.7	34.3	25.0	19.2	30.3	20.8	21.2	17.6	22.9	20.7	24.7
Her husband/ partner	33.3	25.7	33.3	23.1	28.4	25.0	27.3	29.4	25.7	26.7	27.4
The woman and her husband/ partner jointly	8.3	25.7	20.8	23.1	20.2	29.2	6.1	26.5	17.1	20.7	20.5
The woman's mother	4.2	5.7	8.3	7.7	6.4	0.0	9.1	2.9	8.6	4.7	5.4
The woman's mother-in-law	0.0	0.0	0.0	3.8	0.9	4.2	3.0	2.9	0.0	2.7	1.9
The woman's father	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.7	0.4
Someone else	4.2	2.9	0.0	7.7	3.7	0.0	3.0	0.0	0.0	0.7	1.9
Health provider	8.3	2.9	4.2	0.0	3.7	20.8	12.1	14.7	17.1	16.7	11.2
Relative	0.0	0.0	4.2	15.4	4.6	0.0	0.0	2.9	0.0	0.7	2.3
Precipitous labor	0.0	2.9	4.2	0.0	1.8	0.0	15.2	2.9	8.6	6.0	4.2

*village midwife, *puskesmas* midwife, private midwife, unspecified midwife

Table 37 shows that in Serang, around 80 percent of the deceased who were born at hospital died at the hospital, and almost all deceased who were born at hospital died at hospital in Jember (94.7 percent). In Serang, more than one-third of the deceased neonates who were born in other health facilities died at other facilities, and nearly another one-third died at hospital. Also, more than half of the neonates who were born at home also died at home. In Jember, about half of the deceased neonates who were born in other health facilities died at hospitals, and 26.8 percent died at home. Also, about three-quarter of the neonates who were born at home also died at home.

TABLE 37: PLACE WHERE THE NEONATES WERE BORN AND DIED

PLACE OF DEATH	PLACE OF BIRTH				TOTAL
	HOSPITAL	OTHER HEALTH FACILITY	HOME	EN ROUTE	
Serang	**n=45** %	**n=39** %	**n=21** %	**n=4** %	**n=109** %
Hospital	80.0	30.8	28.6	75.0	52.3
Other health facility	0.0	38.5	9.5	0.0	15.6
Home	17.8	28.2	61.9	25.0	30.3
En route to hospital or facility	2.2	2.6	0.0	0.0	1.8
Jember	**n=75** %	**n=56** %	**n=16** %	**n=3** %	**n=150** %
Hospital	94.7	51.8	18.8	100.0	70.7
Other health facility	0.0	19.6	0.0	0.0	7.3
Home	4.0	26.8	75.0	0.0	20
En route to hospital or facility	1.3	1.8	6.3	0.0	2

Table 38 present place of death by place of birth, selected for specific age group of the neonates. In both Serang and Jember, all of the deceased neonates who died on day 0 and were born in hospitals, also died in hospitals. Three-quarters of those born in other health facilities in Serang also died in other facilities. In Jember, half (52.6 percent) of those born in other health facilities, also died in other health facilities. Of those who were born at home, all in Serang died at home, and 86 percent in Jember died at home.

TABLE 38: PLACE OF BIRTH AND PLACE OF DEATH AMONG NEONATES WHO DIED AT 0 DAY

PLACE OF DEATH	PLACE OF BIRTH				
	HOSPITAL	OTHER HEALTH FACILITY	HOME	EN ROUTE	TOTAL
Serang	**n=12** %	**n=12** %	**n=9** %	**n=1** %	**n=34** %
Hospital	100.0	16.7	0.0	100.0	44.1
Other health facility	0.0	75.0	0.0	0.0	26.5
Home	0.0	8.3	100.0	0.0	29.4
Jember	**n=26** %	**n=19** %	**n=7** %	**n=2** %	**n=54** %
Hospital	100.0	26.3	0.0	100.0	61.1
Other health facility	0.0	52.6	0.0	0.0	18.5
Home	0.0	15.8	85.7	0.0	16.7
En route	0.0	5.3	14.3	0.0	3.7

Table 39 presents place of birth and place of delivery among neonates who died between one and six days of age. In Serang, most of the neonates who were born in the hospital, also died in the hospital (71.4 percent). Among those who were born at home, close to half of them died in the hospital (42.9 percent). However, 28.6 percent of those who were born at home, also died at home. In Jember, almost all the neonates born in hospital, also died in hospital (93.9 percent), although not necessarily the same hospital where they were born (data not shown). Forty percent of the neonates who were born at home, died in hospital, and the remaining died at home.

TABLE 39: PLACE OF BIRTH AND PLACE OF DEATH AMONG NEONATES WHO DIED WITHIN 1-6 DAYS

PLACE OF DEATH	PLACE OF BIRTH				
	HOSPITAL	OTHER HEALTH FACILITY	HOME	EN ROUTE	TOTAL
Serang	**n=21** %	**n=22** %	**n=7** %	**n=3** %	**n=53** %
Hospital	71.4	36.4	42.9	66.7	52.8
Other health facility	0.0	27.3	28.6	0.0	15.1
Home	23.8	31.8	28.6	33.3	28.3
En route	4.8	4.5	0.0	0.0	3.8
Jember	**n=33** %	**n=24** %	**n=5** %	**n=1** %	**n=63** %
Hospital	93.9	70.8	40.0	100.0	81.0
Other health facility	0.0	4.2	0.0	0.0	1.6
Home	3.0	25.0	60.0	0.0	15.9
En route	3.0	0.0	0.0	0.0	1.6

As described in Table 40, both in Serang and Jember, among those who died at seven to 27 days of age, more than 70 percent of the deceased who were born at hospital, also died in the hospital. In Serang, 60 percent of the deceased who were born at other facilities, died at home, while the percentage was slightly lower in Jember (46.2 percent). In Serang, we also found that more than half of the deceased who were born at home, died in the hospital. In Jember, 75 percent of neonates who were born at home, also died at home.

TABLE 40: PLACE OF BIRTH AND PLACE OF DEATH AMONG NEONATES WHO DIED WITHIN 7-27 DAYS

PLACE OF DEATH	PLACE OF BIRTH				
	HOSPITAL	OTHER HEALTH FACILITY	HOME	EN ROUTE	TOTAL
Serang	**n=12** %	**n=5** %	**n=5** %	**n=0** %	**n=22** %
Hospital	75.0	40.0	60.0	0.0	63.6
Home	25.0	60.0	40.0	0.0	36.4
Jember	**n=16** %	**n=13** %	**n=4** %	**n=0** %	**n=33** %
Hospital	87.5	53.8	25.0	0.0	66.7
Home	12.5	46.2	75.0	0.0	33.3

3.2.3.2 NORMAL NEWBORN CARE, NEONATAL COMPLICATION AND CARE SEEKING

Among neonates who were born outside the health facilities, we asked about tools and materials used to cut and tie the umbilical cord. In Serang, in 52 percent of the neonates, scissors were used to cut the cord. The next common tool used to cut the cord was new or sterilized razor blade/scissor (40 percent). A similar pattern is also shown in Jember. In both areas, the most common material used for tying the cord was cord clamp (56 percent in Serang and 42.1 percent in Jember). A different pattern was depicted in Jember in the use of unclean piece of thread for tying the cord, where the proportion was much higher in Jember (36.8 percent) than Serang (4 percent).

More respondents in Serang than Jember reported that material(s) was applied to the neonate's umbilical cord stump after birth. There was no apparent difference between neonates born in health

facilities (48.8 percent) and outside the health facilities (44 percent). In Jember, however, only a small proportion of neonates born in health facilities had material(s) applied to the umbilical cord stump after birth (6.9 percent) as opposed to those who were born outside the health facilities (26.3 percent). In Jember, alcohol or other antiseptics were mainly used. In Serang, more than half of the respondents mentioned other material, which was mostly gauze, but respondents did not know whether anything was applied to the gauze.

Overall, breastfeeding was higher among those who were born outside the health facilities than in health facilities (29.5 percent and 19.5 percent, respectively). The difference, however, was much higher in Jember than in Serang. The proportions of breastfeeding among neonates born in health facilities were similar between Jember (19.1 percent) than Serang (20.2 percent).

More neonates born outside the health facilities were bathed within the first 6 hours of birth (34.1 percent) than those who were born in health facilities (10.2 percent). Among preterm neonates born in health facilities, we asked whether they had skin-to-skin care. Only 14.4 percent of them had skin-to-skin care, and the proportions were similar in both districts (data not shown). However, among them, 71.4 percent received the skin-to-skin care immediately after birth and 28.6 percent within an hour. The proportion of neonates who immediately received skin-to-skin care was higher in Jember (85.7 percent) than in Serang (57.1 percent).

TABLE 41: NEWBORN CARE BY FACILITY AND NON-FACILITY BIRTH

	SERANG		JEMBER		TOTAL	
CHARACTERISTICS	HF	NON HF	HF	NON HF	HF	NON HF*
Newborn delivered at non-health facility						
Tool used for cutting the cord		**n=25** %		**n=19** %		**n=44** %
New/from delivery kit/boiled razor blade, scissor		40.0		31.6		36.4
Old razor blade		0.0		5.3		2.3
Scissors		52.0		36.8		45.5
Other		4.0		10.5		6.8
Don't know		4.0		15.8		9.1
Material used for tying the cord		**n=25** %		**n=19** %		**n=44** %
Clean/from delivery kit/boiled piece of thread		8.0		10.5		9.1
Unclean piece of thread		4.0		36.8		18.2
Cord clamp		56.0		42.1		50.0
Other		16.0		0.0		9.1
Don't know		16.0		10.5		13.6
All newborns						
	n=84 %	**n=25** %	**n=131** %	**n=19** %	**n=215** %	**n=44** %
Anything applied to the umbilical cord stump after birth?	48.8	44.0	6.9	26.3	23.3	36.4
Cord:	**n=41** %	**n=11** %	**n=9** %	**n=5** %	**n=50** %	**n=16** %
Alcohol/other antiseptic	53.7	54.5	88.9	100.0	60.0	68.8
Other	53.7	54.5	11.1	0.0	46.0	37.5
How long after birth was the baby first bathed?	**n=84** %	**n=25** %	**n=131** %	**n=19** %	**n=215** %	**n=44** %
1-6 hours	19.0	32.0	4.6	36.8	10.2	34.1
7-23 hours	6.0	12.0	9.2	0.0	7.9	6.8
24 hours or more	2.4	0.0	6.9	5.3	5.1	2.3
Not bathed before death	51.2	40.0	59.5	47.4	56.3	43.2

CHARACTERISTICS	SERANG		JEMBER		TOTAL	
	HF	NON HF	HF	NON HF	HF	NON HF*
Don't know	21.4	16.0	19.8	10.5	20.5	13.6
	n=84 %	**n=25** %	**n=131** %	**n=19** %	**n=215** %	**n=44** %
Child ever breastfed	20.2	24.0	19.1	36.8	19.5	29.5
	n=11 %	**n=8** %	**n=28** %	**n=8** %	**n=39** %	**n=16** %
Well-child postnatal visit**	27.3	75.0	42.9	50.0	38.5	62.5
Skin to skin care for preterm baby	**n=7** %		**n=7** %		**n=14** %	
Immediately	57.1		85.7		71.4	
Less than 1 hour	42.9		14.3		28.6	

*HF: health facility

**Time period measured includes after being discharged but before fatal illness began

Nearly all of the neonates were taken to seek care during their fatal illness (95.8 percent), consistent across the two districts. Although the proportion of those seeking formal care were quite similar between Serang and Jember (93.2 percent and 97.2 percent, respectively), the proportion of the deceased who sought informal care was much higher in Serang (26.2 percent) than Jember (11.0 percent). For each neonate, we tried to assess the severity of the illness at different time points, using self-reported feeding and movement status. In both Serang and Jember, when the families decided to seek care, more than 50 percent of the neonates were already in severe condition, in which the neonates were not feeding or not moving at all (61.5 percent in Serang and 54.6 percent in Jember). Only another 7.3 percent of neonates in Serang and 12.8 percent in Jember were indicated as having mild illness when it was decided to seek care.

The data show that neonates' fathers and mothers were the main decision makers for seeking formal care, consistent in both Serang and Jember. The role of father, however, appears to be stronger than the mother as shown by a higher proportion of cases in which the father was the only decision maker for care seeking (19.8 percent in Serang and 23.4 percent in Jember). In only 5 cases out of a total of 259 neonatal deaths the mother died as well. Distance appears to be an important factor for the neonates' families in both Serang and Jember that influenced their choice of first provider (35.4 percent and 39 percent, respectively), although recommendation from doctor/midwife was the main factor mentioned in Serang.

Among all families who sought care, 29 percent (72/248) mentioned that they had constraint(s) in seeking care (32 cases in Serang and 40 cases in Jember) – data not shown. Among the 72 cases who sought care from a formal provider, 21.9 percent of the respondents in Serang, and 25 percent in Jember mentioned cost as one of the constraints to care seeking. Other constraints in Serang include feeling not satisfied with available healthcare (12.5 percent) and too sick to travel (12.5 percent). On the other hand, the belief that the neonates will die despite care (25 percent) and too sick to travel (15 percent) were other constraints commonly expressed in Jember.

TABLE 42: FACTORS RELATED TO CARE-SEEKING FOR FIRST PROVIDER

CHARACTERISTICS	SERANG	JEMBER	TOTAL
	n=109 %	**n=150** %	**n=259** %
Sought care	94.5	96.7	95.8
Sought care from	**n=103**	**n=145**	**n=248**

CHARACTERISTICS	SERANG	JEMBER	TOTAL
	%	%	%
Formal care	93.2	97.2	95.6
Informal care	26.2	11.0	17.3
Severity when deciding to seek care	**n=96** %	**n=141** %	**n=237** %
Normal - mild illness	7.3	12.8	10.5
Moderate illness	27.1	25.5	26.2
Severe illness	61.5	54.6	57.4
Don't know	4.2	7.1	5.9
Decision maker for formal care-seeking	**n=96** %	**n=141** %	**n=237** %
Child's mother	11.5	8.5	9.7
Child's father	19.8	23.4	21.9
Child's mother and father, jointly	11.5	17.0	14.8
Child's maternal grandmother	3.1	5.7	4.6
Child's paternal grandmother	1.0	1.4	1.3
Someone else	53.1	44.0	47.7
Factors influencing choice of first formal provider	**n=96** %	**n=141** %	**n=237** %
Provider nearby	35.4	39.0	37.6
Recommended by doctor/midwife	43.8	29.1	35.0
Medical reason (abnormality)	10.4	13.5	12.2
More comfortable	12.5	11.3	11.8
Modern service	14.6	9.2	11.4
Feel safe	11.5	9.2	10.1
Habit	8.3	7.8	8.0
Family reason	11.5	2.8	6.3
Few choices	5.2	5.0	5.1
Cheap provider	6.3	3.5	4.6
Other	12.5	7.8	9.7
Constraints to care-seeking for those who sought care*	**n=32** %	**n=40** %	**n=72** %
Cost (transport, healthcare, other)	21.9	25.0	23.6
Thought he/she will die despite care	9.4	25.0	18.1
Too sick to travel	12.5	15.0	13.9
Did not think she was sick enough	9.4	10.0	9.7
Not satisfied with available healthcare	12.5	7.5	9.7
Was late at night	12.5	0.0	5.6
Too far to travel	3.1	5.0	4.2
Communication problems	3.1	2.5	2.8
Problem with health insurance	0.0	5.0	2.8
Too much time from her/caregiver's duties	0.0	2.5	1.4
Someone else had to decide	3.1	0.0	1.4
No transportation available	3.1	0.0	1.4
Symptoms required traditional care	3.1	0.0	1.4
Other issue	46.9	32.5	38.9
Constraints to care-seeking among those who did not seek care*	**n=4** %	**n=2** %	**n=6** %
Thought he/she will die despite care	75.0	0.0	50.0
Was late at night	25.0	50.0	33.3
Too far to travel	25.0	50.0	33.3
Too sick to travel	25.0	0.0	16.7
Other issue	25.0	0.0	16.7

*Multiple answers are allowed

Our finding indicates that about half of the neonates in our study population were severely ill neonates (52.9 percent) that were not feeding or moving at all, when the illness was first recognized by the family. Another 28.2 percent were moderately ill. In more than 80 percent of the neonates, the illness began at the place where they were born (data not shown). Among all deceased neonates who sought formal care, 44 percent were referred from the first provider. However, about one-fourth of them died prior leaving the facility. Among the neonates who left the first facility alive, the majority were severely ill (70.4 percent in Serang and 60.4 percent in Jember).

Among those who were referred and left the first facility alive only 51.9 percent reached the higher-level facility in Serang compared to 91.7 percent in Jember. Among those who were referred and left the first facility alive (n=75), respondents for 38 neonates mentioned that they had concerns regarding the referral. In Serang, cost of healthcare was the most common concern (56 percent), while in Jember, most families thought that the neonate was too sick to travel (38.5 percent). Other concerns raised in Serang included that the families thought the neonates will die despite care, other costs (e.g. for transportation, to cover the family expenses while the neonate was being treated in health facilities), and other reasons. Other concerns mentioned in Jember include other cost, the families thought that the neonates will die despite the care, and other concerns.

Most neonates were referred from *puskesmas* (28 percent), followed by private providers (20 percent), public hospitals (13.3 percent), and trained nurse or midwife (outside a health facility, but public sector) (12.0 percent). Most of the families of the deceased neonates knew the reasons for referral. Similar with maternal deaths, the main reason for referral of the deceased neonates was lack of equipment (84.0 percent), with the proportion being higher in Serang (96.3 percent) than in Jember (77.1 percent).

TABLE 43: REFERRAL OF NEONATES WHO SOUGHT CARE WITH FORMAL PROVIDER

CHARACTERISTICS	SERANG	JEMBER	TOTAL
Severity at first time noticing illness	**n=109** %	**n=150** %	**n=259** %
Normal - mild illness	9.2	14.7	12.4
Moderate illness	28.4	28.0	28.2
Severe illness	58.7	48.7	52.9
Don't know	3.7	8.7	6.6
	n=95 %	**n=137** %	**n=232** %
Neonates referred from first provider	**45.3**	**43.1**	**44.0**
	n=43 %	**n=59** %	**n=102** %
Neonates died prior to leaving facility	37.2	18.6	26.5
Neonates left the facility alive	62.8	81.4	73.5
Severity when leaving first provider	**n=27** %	**n=48** %	**n=75** %
Normal - mild illness	3.7	10.4	8.0
Moderate illness	25.9	22.9	24.0
Severe illness	70.4	60.4	64.0
Don't know	0.0	6.3	4.0
Among all neonates who left the facility alive	**n=27** %	**n=48** %	**n=75** %
Transportation was arranged	77.8	66.7	70.7
Took neonates to all places referred	51.9	91.7	77.3
Concerns in complying to referral among those who had one or more concerns*	**n=25** %	**n=13** %	**n=38** %
Cost of healthcare	56.0	15.4	42.1

CHARACTERISTICS	SERANG	JEMBER	TOTAL
Other cost concern	24.0	23.1	23.7
Thought s/he will die despite care	24.0	15.4	21.1
Thought s/he was too sick to travel	0.0	38.5	13.2
Too far to travel	12.0	15.4	13.2
No one available to accompany	4.0	15.4	7.9
Problem with health insurance	12.0	0.0	7.9
Someone else decided	8.0	0.0	5.3
No transportation available	4.0	7.7	5.3
Not satisfied with available care	0.0	15.4	5.3
Went to a different provider/facility	8.0	0.0	5.3
Was late at night	4.0	0.0	2.6
Too much time from caregiver's duties	0.0	7.7	2.6
The neonate died before going	4.0	0.0	2.6
Other	12.0	0.0	7.9
Provider or facility that referred the cases	**n=27** %	**n=48** %	**n=75** %
Puskesmas	22.2	31.3	28.0
Government hospital	11.1	14.6	13.3
Trained nurse or midwife (outside a health facility for public sector)	18.5	8.3	12.0
Private doctor/clinic	11.1	10.4	10.7
Private hospital	7.4	8.3	8.0
Trained community health worker, nurse or midwife (outside a health facility for private medical sector)	11.1	2.1	5.3
Government health post	0.0	2.1	1.3
Mobile clinic (private sector)	0.0	2.1	1.3
Other private providers	18.5	20.8	20.0
Reasons for referral from first provider*	**n=27** %	**n=48** %	**n=75** %
Necessary equipment not available	96.3	77.1	84.0
Trained provider not available	22.2	10.4	14.7
Necessary procedure not available	0.0	10.4	6.7
Necessary medicines not available	0.0	8.3	5.3
No bed available	7.4	0.0	2.7
Other reason	7.4	27.1	20.0

*Multiple answers are allowed

Hospitals are expected to provide a higher level of care, and thus, improving access to hospital should increase the potential for survival. However, when delays in seeking care occur, cases may arrive in hospital at a terminal stage, and thus their chances of survival may be lower. Although, our questionnaire did not ask specifically about the severity of cases when arriving at the health facility, we used a proxy of severity based on neonates' feeding and movement when the family decided to seek care. Given the fact that the time between deciding to seek care and arriving at the first provider in our study population was short, the condition at the time of deciding to seek care would likely reflect their condition when reaching the first provider.

Using the proxy described above, we examined the severity of neonates that managed to reach the hospital as the first provider (Table 44). We differentiate the findings by whether the illness began in the place where they were born. Among the neonates who were born and received first care in hospitals and the illness began there (n=115), many were severely ill when the families agreed for the neonates to receive care (63.6 percent in Serang and 59.2 percent in Jember) from the same hospital. Considering that a high proportion of neonates in our study were short-lived, this finding indicates that many of the

neonates were ill immediately since birth. Furthermore, among neonates who received first care in hospitals and the illness began there, only about 21 percent left the hospital alive. Among those who left the hospital alive, the proportion of neonates with severe illness remained high, although the number of cases were too small to draw strong conclusion.

Among neonates whose illness did not begin at the delivery facility and who then sought care first in a hospital (n=7), 28.6 percent had severe illness (25 percent in Serang and 33.3 percent in Jember).[5] In Serang, another half had moderate illness, while in Jember the remaining neonates had mild illness. Among the neonates whose illness did not begin at the delivery facility and who were taken first to hospitals, only 28.6 percent left the facility alive.

We also examined the proxy of severity among cases who reached hospitals as their last care provider prior to death. Our finding shows that in both Serang and Jember, most of the cases likely arrived at the hospitals in severe condition (86.4 percent and 68.5 percent, respectively).

TABLE 44: SEVERITY OF CASES WHO SOUGHT CARE FIRST IN HOSPITAL

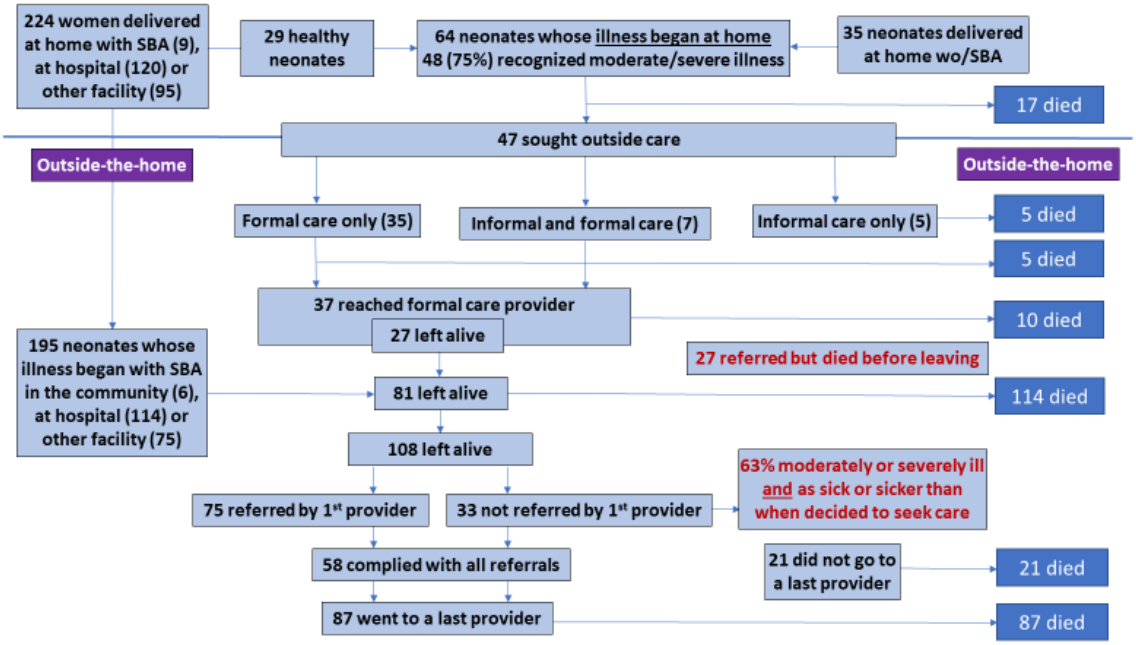
CHARACTERISTICS	SERANG	JEMBER	TOTAL
Hospital as the first provider	**n=48**	**n=74**	**n=122**
Among neonates whose illness began at hospital where they were born	**n=44**	**n=71**	**n=115**
Severity when deciding to seek care to a hospital as the first provider	**n=44** **%**	**n=71** **%**	**n=115** **%**
Normal - mild illness	9.1	8.5	8.7
Moderate illness	22.7	18.3	20.0
Severe illness	63.6	59.2	60.9
Don't know	4.5	14.1	10.4
Condition when leaving the first health provider	**n=44** **%**	**n=71** **%**	**n=115** **%**
Yes, left alive	20.5	21.1	20.9
No, died in facility	79.5	78.9	79.1
Severity when leaving first provider	**n=9** **%**	**n=15** **%**	**n=24** **%**
Normal - mild illness	11.1	20.0	16.7
Moderate illness	33.3	6.7	16.7
Severe illness	55.6	66.7	62.5
Don't know	0.0	6.7	4.2
Among neonates whose illness did not begin at provider where they were born	**n=4**	**n=3**	**n=7**
Severity when deciding to seek care to the first provider	**n=4** **%**	**n=3** **%**	**n=7** **%**
Normal - mild illness	0.0	66.7	28.6
Moderate illness	50.0	0.0	28.6
Severe illness	25.0	33.3	28.6
Don't know	25.0	0.0	14.3
Leave first health provider alive	**n=4** **%**	**n=3** **%**	**n=7** **%**
Yes, left alive	25.0	33.3	28.6
No, died in facility	75.0	66.7	71.4
Severity when leaving first provider	**n=1** **%**	**n=1** **%**	**n=2** **%**
Normal - mild illness	0.0	100.0	50.0
Moderate illness	100.0	0.0	50.0
Neonates who were taken to a hospital as the last provider			

[5] Severe illness is defined as having medium sign of difficulty in any of feeding or moving and abnormal sign in any of those two conditions, or abnormal signs of both.

CHARACTERISTICS	SERANG	JEMBER	TOTAL
Severity when deciding to seek care to the last provider	**n=22** %	**n=54** %	**n=76** %
Normal - mild illness	0.0	5.6	3.9
Moderate illness	13.6	16.7	15.8
Severe illness	86.4	68.5	73.7
Don't know	0.0	9.3	6.6

3.2.4 CARE SEEKING PATHWAY

FIGURE 14: CARE SEEKING PATHWAY



There was a total of 259 deceased neonates studied, of whom 224 were delivered either at home with SBA or at health facilities and 35 were delivered at home without SBA. The care seeking pathway diagram (Figure 14) illustrates the complexity of the illness recognition and care seeking continuum. Again, no control group of sick but surviving children was included. Therefore, all of the 259 neonates whose paths to mortality we have charted exit the diagram at some point along the way as indicated on the right-hand side of the figure. One clear message is that a problem of illness recognition and response in this sample of neonates lies in the health facilities, mostly in the hospitals in which babies are delivered and/or those that are points of first contact with critically ill neonates. About half (53.3 percent) of neonates whose illness began in hospital or other facilities, or who reached a point of first contact with health facilities services alive, died there. Many of them were neonates whose illness began after a medically supervised birth and before discharge. In addition, about two-thirds of the neonates who did leave that point of first contact alive, and who were referred to one or more additional facilities were either as sick or sicker than when care was sought to begin with.

3.2.5 DELAYS DURING CARE SEEKING

Among neonates whose illness did not begin in the delivery facilities where they were born, 80.7 percent (46/57) sought care from a formal health provider. Those who did not seek formal care,

received home care or traditional care. Neonates who were taken to seek informal care prior to formal care potentially experienced a first delay. This is shown from the longer median time needed since recognizing illness until deciding to seek formal care (seven hours) compared to those who decided to seek formal care directly (about five minutes).

Among neonates who received care and left the first facility alive (n=37), it took about half an hour to reach the first provider. Among those neonates, 54 percent (20/37) went to multiple providers, which may indicate a problem in referral. Seventeen of all neonates who sought care, reached a PONEK hospital. Among them, 52.9 percent (9/17) went to another provider before reaching PONEK. Of those 17 neonates, three were referred from one PONEK to another PONEK hospital. The fact that a PONEK hospital referred a neonate to another PONEK suggests that the first PONEK could not provide adequate care for the neonates.

TABLE 45: SUMMARY OF DELAY IN HEALTH CARE SEEKING, SERANG AND JEMBER COMBINED

CHARACTERISTIC	YES N	NO N	TOTAL N	TIME TO/AT FIRST PROVIDER (MEDIAN)	TOTAL TIME AT FIRST PROVIDER (MEDIAN)
Sought formal health care	46	11	57		
Who did not seek formal care*					
Provided home care only	6	51	57		
Sought traditional care only	4	53	57		
First delay (n=57)					
All who sought formal care				1.0 hrs	
Sought informal care first	22	35	57	7.0 hrs	
Sought formal care first	35	22	57	0.08 hrs	
Second delay (n=37)					
All who sought formal care and left the first facility alive				0.5 hrs	0.0 hrs
Went to one provider	17	20	37	0.5 hrs	
Went to more than one provider	20	17	37	0.5 hrs	0.0 hrs
Went to other provider before *PONEK*	9	8	17		
Proxy of third delay◊ (n=17) All who received care from at least one *PONEK hospital*					
Went from *PONEK* to *PONEK*	3	14	17		

Note: table excludes 191 neonates who were born and died in the same facility, no info where illness started, no info on birth attendant.

*1 neonate was taken to both home care and traditional care

**Informal care includes home care, traditional care and care from a pharmacist/drug seller.

◊Delay three could not answered from tool used in EMNC study. However, of cases who reached *PONEK* hospital and were referred elsewhere indicate that even *PONEK* hospital could not provide adequate care.

We observed differences in care seeking between Serang and Jember. Overall, the average time needed for families of the neonates in deciding to seek care from formal provider was shorter in Serang (15 minutes) than in Jember (one hour). However, among those who sought informal care first, the delay in decision making to seek formal care was substantially longer in Serang (11 hours) than in Jember (4.5 hours). Time in reaching the first facility appears to be shorter in Jember than in Serang. Among neonates who received care and left the first facility alive (n=37), on average, it took an hour in Serang and about 17 minutes in Jember to reach the first provider. However, more neonates went to multiple formal providers in Jember (61 percent - 14/23) than in Serang (43 percent - 6/14). The proportion of

neonates who did not directly reach PONEK was substantially higher in Jember (77.8 percent) than in Serang (0.25 percent).

3.2.6 CAUSES OF NEONATAL DEATHS

The three leading causes of neonatal deaths were prematurity, birth asphyxia, and neonatal pneumonia; and the pattern was similar between Serang and Jember. Prematurity accounts for about 68 percent of all neonatal deaths. The proportion of birth asphyxia, however, was slightly higher in Serang (21.1 percent) than in Jember (15.6 percent).

TABLE 46: FIVE LEADING CAUSE(S) OF NEONATAL DEATHS

CAUSE OF NEONATAL DEATH	PERCENTAGE (RANGE)
Serang	
Prematurity	67.5 (58.0-75.5)
Birth asphyxia	21.1 (14.1-29.4)
Neonatal pneumonia	6.8 (2.2-12.1)
Congenital malformation	1.9 (0.2-5.0)
Accidental fall	1.8 (1.8-1.8)
Jember	
Prematurity	68.4 (60.1-76.2)
Birth asphyxia	15.5 (9.9-22.6)
Neonatal pneumonia	8.8 (4.6-14.4)
Neonatal sepsis	2.8 (0.2-6.8)
Congenital malformation	2.0 (0.4-4.7)

FIGURE 15. NEONATAL DEATH BY TIME OF DEATH

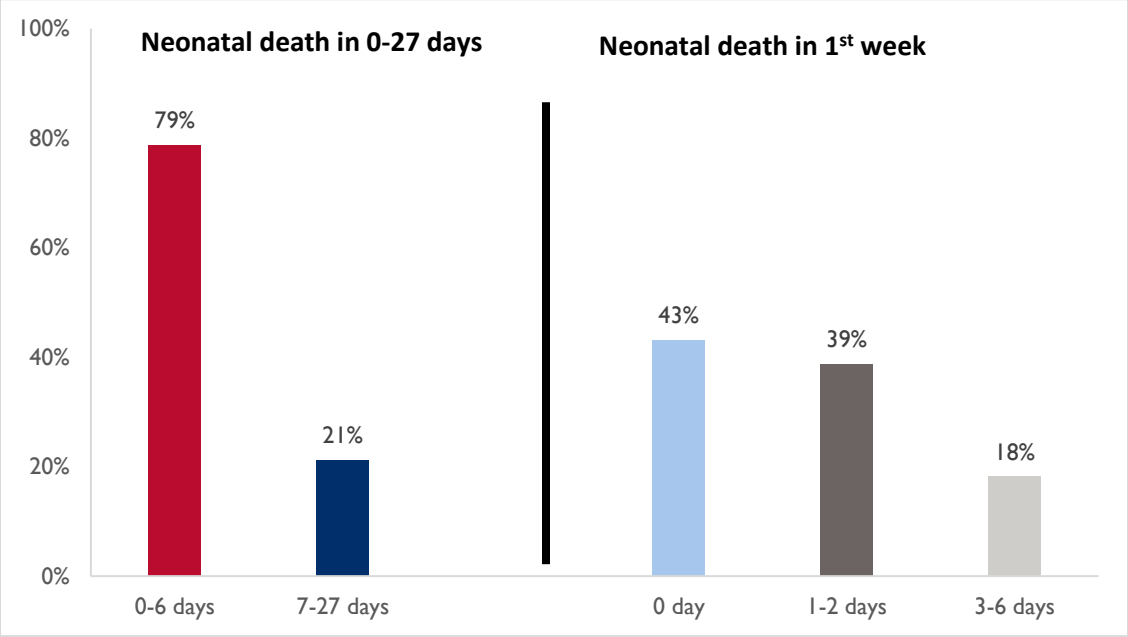


Figure 15 shows that four out of five of the neonatal deaths occurred within the first six days after birth. During that period, many deaths occurred due to prematurity (72 percent). Among neonatal deaths that occurred in the first week after birth, the highest percentage was at zero days (43 percent) followed by one to two days of age (39 percent). During this period, adequate treatment management and postnatal visits are important.

Table 47 shows the causes of neonatal death at the time of death both in Serang and Jember. Time of death was classified into three groups: 0 days, one to six days and seven to 27 days. In general, the causes of death are prematurity (68.3 percent), birth asphyxia (18.1 percent) and neonatal pneumonia (7.7 percent), respectively. Similar findings were also found in the 1-6 days group (65.5 percent, 25 percent, 5.2 percent). A different pattern occurred in the 0 day and 7-27 days groups. In the day 0 group, prematurity (84.1 percent) and birth asphyxia (12.5 percent) were the two leading causes of death. Whereas in the 7-27 days group, the second cause of death after prematurity (49.1 percent) was neonatal pneumonia (25.5 percent) and then birth asphyxia (12.7 percent).

TABLE 47: CAUSE OF NEONATAL DEATH BY TIME OF DEATH, SERANG AND JEMBER

	AGE IN DAYS AT DEATH			
	0 DAY	1-6 DAYS	7-27 DAYS	TOTAL
CAUSE OF DEATH	N=88 %	N=116 %	N=55 %	N=259 %
Prematurity	84.1	65.5	49.1	68.3
Birth asphyxia	12.5	25.0	12.7	18.1
Neonatal pneumonia	0.0	5.2	25.5	7.7
Congenital malformation	0.0	1.7	5.5	1.9
Neonatal sepsis	0.0	1.7	5.5	1.9
Others*	3.4	0.9	1.8	2.0

*accidental fall, road traffic accident, and acute respiratory infection including pneumonia

Analysis of neonatal causes of deaths by place of birth shows that a relatively high proportion of neonates who died due to prematurity and birth asphyxia were born in health facilities other than hospitals (39 percent and 23.4 percent, respectively). Those facilities include *puskesmas*, clinics, private practice midwives, or village maternity home; and they may not have adequate facilities to provide care for preterm babies or birth asphyxia. Another 44.1 percent and 66 percent of neonates who died due to prematurity and birth asphyxia, respectively, were born in hospitals. This may indicate a problem with quality of care in hospitals since most prematurity-related deaths occurred on the day of birth (84 percent) and about 60 percent of the deaths from birth asphyxia occurred on Day 2 or Day 3 after birth (Table 48).

TABLE 48: CAUSES OF NEONATAL DEATHS BY PLACE OF BIRTH, SERANG AND JEMBER

	PLACE OF BIRTH			
	HOSPITAL	OTHER HEALTH FACILITY	HOME	EN ROUTE TO HOSPITAL OR FACILITY
CAUSE OF DEATH	%	%	%	%
Prematurity (n=177)	44.1	39	14.1	2.8
Birth asphyxia (n=47)	66	23.4	8.5	2.1
Neonatal pneumonia (n=20)	40	40	20	0
Neonatal sepsis (n=5)	0	80	20	0
Congenital malformation (n=5)	20	40	20	20
Accidental fall (n=2)	0	0	100	0
Road traffic accident (n=2)	50	50	0	0
Acute respiratory infection including pneumonia (n=1)	100	0	0	0

3.2.7 INSURANCE AND NEONATAL MORTALITY

There is an apparent difference in the use of health insurance among the neonates' mothers between the two districts. Overall, around one-third of the neonates' mothers were not covered by any health insurance; and the proportion was quite similar between the two districts. However, a substantially higher proportion of the neonates' mothers in Serang (56 percent) had to spend money to access care, in addition to their insurance, compared to Jember (21.3 percent). Nearly half of the neonates' mothers in Serang were covered by *JKN non-PBI* (47.7 percent), while many of the neonates' mothers in Jember were covered by either *JKN PBI-APBN* (20 percent) or *Jamkesda* (26.7 percent). These data indicate that more of the neonates' mothers in Jember have their health payment subsidized by the government.

In both Serang and Jember, most of the mothers did not use any insurance during their last ANC visit (80.6 percent and 72.9 percent, respectively). They possibly paid out-of-pocket or the service was free of charge. This is likely because most of the providers visited for ANC were village midwives. ANC visits with village midwives are usually conducted at the *posyandu* (integrated community health post), which is usually free of charge or a very low cost. The second highest method of payment for last ANC was *JKN PBI-APBN* in Jember (16.7 percent) and *JKN non-PBI* in Serang (12 percent).

Among the deceased neonates who were brought to seek care from formal provider(s) during their fatal illness, about half of them did not use any health insurance when they were at the first provider (56.3 percent in Serang and 50.4 percent in Jember). The use of *JKN PBI-APBN* and *Jamkesda* at the first provider, which can be seen as an equivalent to insurance for the poor, among neonates were higher in Jember (39.7 percent) than in Serang (16.7 percent).

Similar with the method of payment at the first provider, among the deceased neonates who were brought to seek care from more than one formal provider (n=28 in Serang and n=59 in Jember), the most common method of payment was out-of-pocket. Still, the contribution of *JKN PBI-APBN* and *Jamkesda* at the last provider was higher in Jember (47.4 percent) than in Serang (25 percent). However, there was an increase in the use of those two methods of payment in both districts, which may be influenced by the severity of the illness that requires a higher level of care with higher cost.

TABLE 49: INSURANCE FOR NEONATAL CARE DURING FATAL ILLNESS

INSURANCE	SERANG %	JEMBER %	TOTAL %
Mother's health insurance*	**n=109**	**n=150**	**n=259**
None	29.4	32.7	31.3
JKN PBI- APBN	9.2	20.0	15.4
JKN non-PBI (PBPU and PPU)	47.7	8.7	25.1
Jamkesda/JKN PBI- APBD	4.6	26.7	17.4
Jampersal	10.1	1.3	5.0
Self-paid	56.0	21.3	35.9
Company	1.8	1.3	1.5
Method of payment for last ANC visit*	**n=108**	**n=144**	**n=252**
No insurance (i.e. out-of-pocket or free of charge)	80.6	72.9	76.2
JKN PB - APBN	3.7	16.7	11.1
JKN non- PBI	12.0	4.9	7.9
Jamkesda/JKN PB- APBD	2.8	4.9	4.0
Company	0.9	0.7	0.8
Method of payment for neonatal care-seeking during fatal illness			
Method of payment at first provider*	**n=96**	**n=141**	**n=237**
Out-of-Pocket	56.3	50.4	52.7

INSURANCE	SERANG %	JEMBER %	TOTAL %
JKN non- PBI (PBPU and PPU)	26.0	7.1	14.8
JKN PBI-APBN	7.3	17.0	13.1
Jamkesda/JKN PB-APBD	9.4	22.7	17.3
Company	1.0	2.1	1.7
Method of payment at last provider*	**n=28**	**n=59**	**n=87**
Out-of-Pocket	50.0	45.8	47.1
JKN non-PBI	25.0	5.1	11.5
JKN PBI- APBN	7.1	16.9	13.8
Jamkesda/JKN PBI- APBD	17.9	30.5	26.4

*Multiple answers are allowed

4 DISCUSSION

4.1 IDENTIFICATION OF MATERNAL AND NEONATAL DEATHS USING MADE-IN/MADE-FOR AND NODE-IN/NODE-FOR METHODS

Both methods, MADE-IN/MADE-FOR and NODE-IN/NODE-FOR, have identified more maternal and neonatal deaths in both districts, as compared with the District HIS. However, the coverage of maternal death identification is better than that for neonatal deaths.

The MADE-IN/MADE-FOR methods had been implemented three times (Immpact study in 2004-2005, Banten II Study in 2018 and EMNC in 2019). From those studies, the coverage of maternal deaths by the method was high (more than 90 percent) in all studies. The newly applied method for neonatal death (NODE-IN/NODE-FOR) in the EMNC study has also captured more than 90 percent of the deaths.

While we captured similarly high coverage of maternal and neonatal deaths, our experience in the field taught us that it is harder to confirm neonatal deaths compared to maternal deaths. This was because in some cases it was difficult for the mothers and other respondents to differentiate between stillbirth and neonatal death (born alive and then died). The same problem is also faced by the DHO HIS. Both DHO and this study captured some cases which were misclassified between stillbirth and neonatal death. During the meeting with the village informants, we observed that they also had difficulty to distinguish between stillbirth and neonatal death which was later confirmed during VASA interview.

Comparing the DHO HIS with our study, we assumed that when the DHO system can identify maternal death better, the gap between the DHO system and MADE-IN/MADE-FOR will be smaller. The findings showed this to be the case. Maternal deaths identification by MADE-IN/MADE-FOR in Serang (92 percent) was as good as in Jember (96 percent) [21]. However, the gap between MADE-IN/MADE-FOR and DHO was higher in Serang than in Jember, indicating that the DHO information system is better in Jember (30 percent) than Serang (60 percent).

We have learned that in Jember there has been high concern about maternal deaths since it is one of the districts with the highest number of maternal deaths in East Java. The DHO has been encouraging the reporting of maternal death from *puskesmas* and hospitals. Another explanation could be that the percentage of deaths in health facilities was higher in Jember as compared with Serang (81 percent verses 65 percent) [33], therefore it is more likely that maternal deaths in facilities would be reported more than the deaths in the community.

Similar to maternal death reporting in Jember, Serang is currently improving their effort to capture neonatal deaths. This probably explains why the difference in neonatal death coverage between the DHO system and NODE-IN/NODE-FOR is smaller in Serang than in Jember.

4.2 DISCUSSION OF VASA

4.2.1 INSTRUMENTS

VASA instruments (for maternal and neonatal deaths) were developed from the WHO VA version 1.5.1 and the COMSA VASA from JHU. The instruments were developed to clarify whether the deaths were maternal or neonatal, help determine the cause(s) of deaths, and to investigate the care seeking pathway, besides helping to understand the socio-demographic characteristics of the deceased and their

household. Thus, the instruments provide relatively comprehensive information. However, the instruments were not aimed to assess the quality of care received by the deceased in the health facility, and thus, cannot be used to determine delay three.

The VASA questionnaire is lengthy and has relatively complicated questions. This creates challenges in the development of tablet-based data collection programs, especially because the instrument is a combination of two questionnaires. Thus, it took several months for this study to finalize the electronic-based data collection instruments. The process involved several trials and field tests. In fact, in the early phase of data collection, there were some changes required to fix skip patterns. Some issues in the data collection also occurred as not all potential problems were accommodated during the instrument development or training.

4.2.2 INTERVIEWS

Although the instruments have many questions that can be skipped under certain conditions, most interviews still required quite a long time, two hours on average. The most challenging section for respondents' recall was the care seeking sections. In most situations, respondents needed more time to recall the chronology of the care seeking starting from symptom recognition, until the time of death. For this section, we often need to interview multiple respondents, especially when the deceased was taken to more than one provider, by more than one family member.

In some cases, differentiating between live birth and stillbirth is not straightforward. The team needed to do more probing to clearly define the condition at birth. For example, by asking whether the deceased had resuscitation, respiratory assistance, as well as reviewing secondary data (letter of death from health the facility).

4.3 MATERNAL DEATH

In Jember, the leading cause of maternal deaths was hemorrhage (29.7 percent), followed by pregnancy-related sepsis (18.1 percent), pregnancy-induced hypertension (16.4 percent), and other and unspecified cardiac disease (8.8 percent). The top three causes of death are quite consistent with the DHO's report in Jember (2018), as well as with the global picture of the causes of maternal deaths [34].

The pattern of causes of death in our study, however, is not exactly consistent with the findings from the Banten II Study. To determine the cause of maternal death, we used Inter-VA for the Banten II study, while for the EMNC study we used InSilicoVA. While the leading cause of death in both studies was the same, (obstetric hemorrhage -38.3 percent in Banten and 29.7 percent in Jember), the appearance of other causes of maternal deaths varied between the studies. In Serang, the next most common causes of deaths were pregnancy-induced hypertension (19.1 percent), anemia during pregnancy (13.6 percent) and other indirect causes [33]. We cannot evaluate whether the difference is caused by different methods used, different risk factors between the two districts or other reasons (e.g sample size too small to make statistical difference).

Every pregnancy is at risk for developing complications. About 15 percent of all pregnant women will potentially develop a life-threatening complication, and most of the complications are unpredictable [35]. Therefore, each pregnancy must have access to quality emergency care at any time when a complication arises. The type of complications found from this study were: postpartum hemorrhage (30.7 percent),

percent intrapartum hemorrhage (22.7 percent), high blood pressure during pregnancy (27.2 percent), and antepartum hemorrhage (8.7 percent).

The ability to save a woman's life depends not only on the quality of care received in hospital, but also how severe the patient's condition is when she arrives at the hospital. This involves care at community level where prevention of complication, early identification of complication, adequate first care, and stabilization of the condition should be provided. It also involves an effective referral process.

The results of EMNC study in Jember district showed that most of maternal deaths happened in hospitals, especially public hospital (67 percent of total deaths). This indicates that the burden in public hospitals is high, especially because *JKN* has significantly increased access to public hospitals. Our study did not intentionally measure the quality of care; however, our findings have led us to hypothesize that: i) the quality of care in hospital is sub-optimal; and/or ii) the condition of the mother was already at terminal stage when they reached the hospital.

The severity of cases at arrival can be the result of late decision-making on the part of mother /family to seek a health provider, sub-optimal care given by the first health provider in or outside facility, and late decision by the health provider to refer. Other possible explanations include in-effective referral due to unavailability of CEmONC hospital to provide quality care and lack of monitoring and adequate care during transportation. In our study, the problem is more on the latter issues where the informants indicated that most of the deceased were referred due to lack of facilities and/or human resources.

The quality of ANC has raised questions, despite the fact that the coverage of ANC visits was high. This study showed that one quarter of mothers died during pregnancy, and half of them died in hospital. While the proportion of mothers who received ANC according to the guideline are high, only around half of them received blood test for hemoglobin (hB) and even fewer received a urine test. On the other hand, the main cause of deaths was hemorrhage, where maternal anemia is one of the important risk factors. Among those with ANC visits in accordance with the ANC program, 56.2 percent were counselled on pregnancy complications and 68.5 percent were counselled on where to go if they had a complication.

About one-third of maternal deaths happened in the very short period of time between labor/delivery and 24 hours postpartum. Two thirds of the deaths in this period were caused by obstetric hemorrhage. This raises concern about whether this is related to the lack of blood for transfusion in hospital and high maternal anemia prevalence, especially because national data showed that maternal anemia prevalence is 48.9 percent [32]. Even though this study did not have information on anemia, 45 percent of the women were reported to look pale or have pale palms, eyes or nail beds. In addition, 42 percent of the women who received formal care were reported to receive or need blood transfusion during their fatal illness.

While this period provides a good opportunity to save the mothers' lives, it similarly raises challenges because it demands 24/7 ambulance service and quality care at all level of facilities with strong support of the referral system.

The study revealed that about one quarter (24.3 percent) of maternal deaths happened between day 2 to day 15 postpartum, and within this period 60 percent died within two to seven days postpartum. The rest of the deaths, 15.5 percent, happened in a later period of postpartum (16-42 days). In this study, the main causes of deaths in the first week postpartum were obstetric hemorrhage and pregnancy related

sepsis, and in the second week, pregnancy related sepsis. To prevent the deaths more intensive postpartum visits during the first two weeks of the postpartum period is needed. Other studies also reported that the main causes of maternal deaths in the postpartum period occurring up to one week after delivery are bleeding, pre-eclampsia and infection [36].

4.3.2 MATERNAL CARE SEEKING PATTERNS

The recognition of illness among maternal deaths in our study population was relatively high, as seen from the fact that almost all of the deceased sought care during their fatal illness, and most of them sought formal care directly (85 percent). In the Banten II study, 54 percent of those who sought care during the fatal illness went directly to formal care [21]. A study in Bangladesh, for example, showed that only 57.8 percent of the women who died sought care from a skilled professional [37].

The decision to seek care was made within the same day of symptom recognition. About half of the cases made the decision to seek any care (formal and non-formal) in less than two minutes (n=65). This may indicate the severity of the illness which drove quick decision making, as our data shows that half of the 65 cases died on the same day of the symptom occurrence. The median time of those who directly went to formal care was 0 hours. Other than severity, this might be explained by the possibility that the complication began at the health facility where the women came for normal delivery, and thus the decision was made quickly. Seeking informal care first, however, contributed to half a day of the first delay.

In our study, the second delay is indicated by the proportion of cases that went to more than one provider. Delay two appears to be an issue for our study population, as indicated by the fact that most of the cases went to more than one provider.

Our study was not designed to measure delay three because we did not study the care in the hospital. We did ask questions about the waiting time since arrival until receiving care at the last provider. However, since we relied on respondents' perception, our study cannot distinguish whether the care received was adequate once provided. Thus, we used a proxy to indicate Delay 3, represented by referral from PONEK hospital to another PONEK. The data sample, however, was too small to draw any conclusion. Nevertheless, the fact that although most of the maternal deaths reached a PONEK hospital (76 percent), many of them (67 percent) had to visit multiple providers prior to the PONEK, raising concerns about the effectiveness of the referral system. For patients who used insurance for the poor, they have to comply with the tiered referral system, except in emergency cases. This means that the patients have to go to primary care level before they can be referred to a hospital, unless the first provider is able to diagnose an emergency. In addition, we found that seven out of 73 or cases that arrived at a PONEK were referred to another PONEK hospital. We assume that the PONEK hospital that referred the cases to another hospital does not have the capacity to provide emergency quality care. However, given the very small number, we should interpret this finding with caution.

4.4 NEONATAL DEATH

Neonatal deaths have been assumed to be related to the quality of delivery care, therefore when maternal deaths are high, neonatal deaths are usually also high. National data showed that the ratio of neonatal to maternal death is about four. The results from the EMNC study and Banten II Study in Serang shows that the ratio of neonatal to maternal deaths was 3.3 while in Jember it was 5.6. The

lower ratio of neonatal to maternal death in Serang is probably caused by fewer neonatal deaths but more maternal death in Serang as compared with Jember.

The study results show that more than half of deaths happened in hospitals. Among those delivered in hospitals, around 88 percent died in hospitals. As with maternal deaths, the high neonatal death rate in hospital can be the result of sub-optimal quality of delivery care and neonatal care, or the cases arrived in hospital at terminal stage [38]. It is known that the survival and health of the newborn can be improved if the care provided is of good quality, from pregnancy and delivery, to postnatal care for the mother and the newborn and the care for small and sick babies [38], however, this population-based study did not examine the quality of care in detail.

Three quarters of neonates died in the first week postpartum, and the highest proportion of deaths globally in the first week is on the first day postpartum [34]. In this study, most (80 percent) of neonatal deaths happened in the first week, and within the first week 43.1 percent died in the first day. While the first 24 hours after birth is a crucial time when complications can happen [38], we do not have information on whether the newborn stayed in the health facility for at least 24 hours after birth. The next highest period of death is on day one and two, counting for 38.7 percent of deaths in the first week. The deaths in the first 3 days (0-2 day) after delivery account for 64.5 percent of all neonatal deaths. Our data showed that 17 percent of those who were born in health facilities died at home for both districts, with a higher proportion in Serang (23 percent) than Jember (14 percent). The figure for both districts was higher (28 percent) among the babies aged 1-6 day. Death at home can be caused by early discharge from the health facility, delays in seeking care and referral problems [38].

Global evidence indicates that the main direct causes of neonatal death are estimated to be preterm birth (28 percent), severe infections (26 percent), and asphyxia (23 percent) [34]. The results of this study show that the proportion of prematurity as the cause of death is very high in both districts, 67 percent in Serang and 68 percent in Jember. We are not sure whether this difference is caused by different determinants of cause of death or what regional components influenced this result. The fact that the prevalence of anemia among pregnant women in Indonesia is very high (49 percent) [39] and the proxy indicator of chronic energy deficiency based on Mid-Upper Arm Circumference (MUAC) <23.5cm in pregnant women was 31.8 percent, probably explains why prematurity as the cause of death is very high. Both anemia and chronic energy malnutrition during pregnancy are risk factors for prematurity and low birth weight [32].

Based on the WHO, premature births are divided into three groups, including extremely premature (less than 28 weeks), very preterm (between 28 and 32 weeks) and moderate / late preterm (between 32 and 37 weeks) [40]. In this study, we only included babies who were born over 28 weeks' gestation. Beside maternal anemia, prematurity can be caused by many, such as the condition of the placenta, complications in the mother, infections, etc. To prevent premature labor, it is best for health workers to correctly identify the gestational age of the mother during ANC, so if the mother experiences a contraction before the start of 37 weeks of pregnancy, she should immediately be referred for further treatment to a hospital with adequate facilities, for example NICU, to anticipate any neonatal complication.

4.4.1 NEONATAL CARE SEEKING PATTERN

The spouse/partner played an important role in decision making regarding seeking care among maternal deaths in Jember and neonatal deaths in the two study districts. For neonatal care seeking, the role of

the father was stronger in Jember than in Serang, as seen from the high proportion of cases in which the decision was made by the father only or with the mother jointly. Mothers' and fathers' education levels were relatively similar. The communities in the study districts are similar to most areas in Indonesia which is mostly a patriarchal society. While characteristics of the parents of the deceased in both areas were similar, the education level of the general population in Jember is slightly higher compared to Serang (6.27 percent difference in the proportion of those who attended high school) [41] [42]. The strong role of husbands in this study is consistent with evidence from a previous study investigating illness recognition and care seeking patterns related to maternal and newborn complication in the Jaya Wijaya district of Indonesia which concluded that the decision-making process was mostly dominated by the husband [43]. Another study found that an indirect factor that may be associated with maternal death was related to women's lack of autonomy in decision making. The role of husbands/partners in decision making to seek formal care was also reported in other studies [44] [45] [46]. The implication from our finding indicates the need to not only increase awareness amongst women but also include husbands in the education about danger signs of maternal and newborn complications and where to seek formal care when the complication occurs. This can be done for example by encouraging husbands to attend ANC with their wives. Health providers then should ensure that the husbands are present during counselling.

As previously explained in another part of this report, the spouse/partner was the main decision maker for care seeking especially when choosing the place of delivery. Based on this finding, it will be better if men are aware of the unpredictability of complications and whether the pregnancy is at risk, so they can make an appropriate decision in care seeking [39]. A study in Bangladesh found that involvement of husbands was greater during ANC and the labor/delivery process. Three symptoms that are widely known by husbands regarding maternal emergency cases according to that study, are high fever, severe abdominal pain and severe bleeding [47].

From this study, if we only refer to the median time from deciding to seek care until reaching the first provider, which is only 0.17 hours, we do not see any barriers in accessing health facilities in Jember. Providers in this case are not just hospitals but any providers, including private practice midwives and other health facilities. Although there are 12 hospitals in Jember, there is only one hospital that qualifies as a CEmONC Hospital, which is also a regional referral hospital for several other districts. Jember has relatively good infrastructure and number of facilities. in contrast to Serang, which is predominantly rural, Jember has relatively more urban areas.

Most of the neonates in our study population were already in a severe (57.4 percent) or moderate state (26.2 percent) when the symptoms were recognized. The majority of the deceased neonates started developing illness in the health facilities where they were born, and thus, most of them immediately received care. For those whose illness began in the delivery place, detailed information about the care was limited because, for example, many of them were taken to the perinatal ward or NICU immediately after birth. Among the deceased neonates who sought care from home, about 20 percent did not seek formal care. The remaining cases sought informal care first, prior to formal care. Similar to the findings regarding maternal deaths, care seeking from informal providers contributed to the first delay, as indicated by about seven additional hours needed to decide to seek formal care compared to those who directly sought formal care. Delay two, indicated as the proportion of cases who went to multiple providers, is lower in the deceased neonates (54 percent) compared to maternal deaths (76 percent). This finding, however, may be explained by the neonates' short life.

4.5 INSURANCE

Even though the proportion of neonates' mothers who had insurance (all type of NHI) was high, the coverage for neonates was low. This finding is due to the fact that at the time of the data collection period, the mother's insurance did not necessarily automatically cover the newborn. This regulation, however, has been updated recently to cover the newborns of mothers who are *JKN* members [48]. Currently, the government has a target to increase NHI participation by the end of 2019 [49]. Nationally, the trend shows that coverage of *PBI-APBN, PBI-APBD* and *Non-PBI* (*PBPU)* has significantly improved in terms of achieving universal coverage as mandated by the Indonesian law [50]. There are several issues that can be considered as obstacles, including socialization, understanding of health workers and participants, and also keeping up to date with the regulations that are continuously changing. Socialization of NHI rules is relatively poor, not only to health workers but also to the community as users. The lack of understanding of health workers/providers as implementers of health services delivery is frequently found, not only at primary care provider level, but also in referral facilities such as hospitals. In addition to a lack of understanding of regulations, the community also consider the referral system difficult and convoluted [51]. On the other hand, we note that as a single payer with the largest membership in the world [52], *Badan Pengelola Jaminan Sosial (BPJS) - Kesehatan* has made several changes in regulations in an effort to improve their services and respond to some problems of both providers and users.

4.6 STUDY LIMITATIONS

Although this study provides district-wide maternal and neonatal data, and detailed information about care-seeking pathways, there are several limitations that should be taken into account. Given the fact that this study collected information retrospectively, recall bias should be considered. To minimize recall bias, we have limited the recall period in such a way that would still allow us to obtain a sufficient number of events for a robust analysis. In addition, the implementation of a similar data collection approach had been conducted in our previous studies, and we did not find significant issues with informants' recollection of the death cases.

It should also be remembered that no control group was used, and the determinants of maternal and neonatal deaths cannot be established from these data. Interpretation and generalization of results need to be made with caution.

The study was not designed to measure delay three and quality of care because we did not collect hospital service data. While we did ask about the waiting time, we relied on respondents' answers, and do not have objective, observational data to determine whether the care received was timely and adequate for patients. As a proxy indicator for delay three we used referral from one PONEK to another PONEK hospital.

Regarding the VASA tool, which was adapted from two different questionnaires (the WHO's VA and JHU's SA), there are several limitations noted:

- The age limit for neonatal death from WHO's VA tool is less than 28 days. To arrive at an accurate age, time in days and hours become important. The absence of information on time of birth and time of death (in hours, besides days) may lead to inaccurate age calculation.

- The questionnaire asked in detail about time between recognizing illness symptoms and receiving care at the final health facilities. However, the questionnaire is missing information about the length of stay in each facility, and length of time from one facility to another until the last facility.

- The key to successful interviews is to interview the most knowledgeable respondents, which often involves multiple individuals. It would be beneficial to have information about the respondents involved, for example, to obtain a picture of who was involved in the care seeking process. However, the questionnaire does not accommodate this information.

- Development of the electronic-based data collection tool from a complex questionnaire like VASA was challenging. There were more efforts needed, than expected, in testing the ODK prior to data collection.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 MAKING EVERY MOTHER AND NEWBORN COUNT

STUDY FINDINGS: The MADE-IN/MADE-FOR method is well documented as providing the best way to enumerate maternal deaths at the local/district level. NODE-IN/NODE-FOR, an adaptation of the maternal method, also identified additional neonatal deaths compared to the routine system. While the two methods are comparable in terms of identification of deaths, the difference between deaths identified by the DHO versus the methods used in the EMNC study is not consistent for neonatal and maternal deaths or between districts. The method identified a bigger gap in maternal death in Jember compared to Serang, and neonatal death identification was better in Serang than Jember.

CONCLUSION: We conclude that both the relatively simple MADE-IN/MADE-FOR and NODE-IN/NODE-FOR methods may be valuable to the district/municipality level to best identify the number of deaths and their characteristics. This is important for evaluation of the program and as the basis to develop a strategy to reduce maternal and neonatal death. From our analysis, most of the cases missed by DHO HIS were deaths in hospitals.

RECOMMENDATION: The routine identification of maternal and neonatal (or perinatal) deaths can be improved through better coordination between hospitals and the DHO. Another area of improvement is tracking of pregnant women who do not visit health providers regularly e.g through community midwives (Bidan Didesa). Districts should strengthen the routine HIS to capture all deaths occurring in hospital. In the interim period, districts can implement the MADE-IN/MADE-FOR and NODE-IN/NODE-FOR steps to obtain more complete counts of neonatal and maternal deaths.

MADE-IN/MADE-FOR and NODE-IN/NODE-FOR could also contribute to the routine enumeration in systems like MPDSR by providing a more complete way of detecting cases for follow-up compared to other common methods.

5.2 MATERNAL RECOMMENDATIONS

STUDY FINDING: The results of the EMNC study arm on maternal deaths in Jember District show that:

- Over one quarter of women who died had hypertension in pregnancy;
- Seventy-five percent of maternal deaths occurred in hospital, of whom two-thirds died in a public hospital;
- Thirty-six percent died during delivery and the first 24 hours postpartum;
- The leading cause of maternal deaths was hemorrhage (29.7 percent); and
- Two-thirds of deaths occurring during labor/delivery or the first 24 hours postpartum were caused by obstetric hemorrhage and access to blood transfusions might have been challenging.

CONCLUSION: Life-threatening complications among pregnant women can be sudden and unpredictable [38]. This can be caused by low hospital quality of care, late arrival in the hospital, or both. Late arrival in the hospital can be the result of ineffective referral. It is possible that not all

complicated cases referred to hospital received adequate care. Facilities appear not to be sufficiently well-equipped to contend with these complications.

RECOMMENDATIONS: It is imperative to ensure that every woman while pregnant, in childbirth, and after delivery has access to quality prenatal and obstetric emergency care should risks increase or complications occur. The quality of care should be addressed comprehensively and needs to ensure that all diagnostic and treatment is conducted to recommended standards, including in primary care and all hospital levels, involving adequate early identification of complication, adequate case management, and effective referral. This can be promoted by:

- Ensuring that women are monitored for at least 24 hours postpartum and that women at risk of postpartum hemorrhage are flagged for increased monitoring; and
- Ensuring the availability of blood for transfusions and the competency to provide it according to standard.

STUDY FINDING: Eighty-four percent of the deceased sought formal care directly, with a median time of 0 hours to reach first provider. However, among the sizable minority (14 percent) who sought informal care first, the delay in arriving at a health facility for care was 12.5 hours longer. Just two percent of maternal deaths received home care only.

CONCLUSION: Most of the deceased died in hospitals. Unfortunately, the study data does not permit a detailed examination of what transpired for the 84 percent of deceased mothers after their quick arrival at a facility. However, our data, together with discussions with the DHOs, suggest there may simply be insufficient capacity to provide quality care (e.g. number of human resources, beds, etc.) or the health staff is not available and reachable in person.

For those pursuing informal care, delays may be critical. Informal providers and families may not possess sufficient knowledge about when to seek formal care with urgency.

RECOMMENDATION: Improve quality of care and its availability for 24-hours per day and seven days per week (24/7) at community (*puskesmas* PONED/BEmONC) and hospital levels, and strengthen the referral system, such that the continuation of quality care from community level to hospital can be assured (see, e.g., the 'continuum of care' [53]) and ensure that all procedures are conducted according to protocols.

Furthermore, to guarantee that all emergency cases receive adequate and timely care, we propose that districts establish a consortium of PONEK/CEmONC services provided by all available CEmONC hospitals in the district. The consortium refers to collaboration between a group of hospitals (public and private) in providing CEmONC functions. When necessary, the consortium can be expanded to hospitals in the neighboring district to cover those living in the border area or who have too far to go to reach their own district hospital. In supporting the implementation of the Consortium of PONEK/CEmONC services, *Pemerintah Daerah* (Local Government) (PEMDA) and NHI need to develop related regulations and a mechanism to ensure all maternal and neonatal emergency cases receive appropriate care in any hospital in the area, including cross border.

STUDY FINDING: Although most women had received ANC during pregnancy, a minority had received all recommended interventions and just 34 percent of all women had had a urine test during any ANC visit.

CONCLUSION: More information is needed about the quality of ANC being provided to inform an effective intervention to improve outcomes for women, and in particular to monitor hypertension in pregnancy/pre-eclampsia.

RECOMMENDATION: Improve the quality of ANC and facilitative supervision. Better monitoring during pregnancy is needed to detect and manage complications that arise and to mitigate the potentially life-threatening consequences of those complications. This will allow the health provider to plan follow-up care if the mothers have a problem, such as hypertension, and to provide counselling on danger signs and where to go if danger signs occur. There needs to be an accountability mechanism to ensure compliance with technical guidelines that outline timing for blood and urine test, for example blood test examination for Hb level at first ANC in trimester one; urine test for those with high blood pressure; and follow on monitoring of women with high blood pressure and anemia until the end of pregnancy following the national standard for ANC.

STUDY FINDING: Fully 24 percent of maternal deaths happened between day two and 15 postpartum; within this period 60 percent died between two and seven days postpartum. The main cause of death was obstetric hemorrhage, followed by sepsis and pregnancy induced hypertension. The proportion of deaths occurring in the second week is higher than subsequent weeks. From our data, we do not know the condition of these women at discharge. We do not know if women were discharged with hypertension or any active infection, for example, nor do we have data on whether follow-up care was provided and if so, of what kind and quality.

CONCLUSION: Mothers may be leaving hospital without an awareness of risk factors or danger signs to prompt a swift response post-discharge.

RECOMMENDATION: The first two weeks postpartum provide a good opportunity to reduce maternal deaths. Strengthen the postpartum visit program with priority in the first week followed by the second week postpartum. A visiting health provider's understanding about postpartum hemorrhage, infection/sepsis and pregnancy-induced hypertension is crucial especially when conducting the visit in the first week postpartum. Ensure that women are monitored for at least 24 hours postpartum and that women at risk of postpartum hemorrhage are flagged for increased monitoring. An awareness of danger signs among families may be life-saving in the first week postpartum. Improve the capacity of public hospitals to address obstetric hemorrhage, including in-service training and/or drills for cases of obstetric hemorrhage, ensuring availability of supplies and equipment needed to treat obstetric hemorrhage, at all times.

5.3 NEONATAL RECOMMENDATIONS

STUDY FINDING: Nearly two-thirds of all neonatal deaths happened in hospitals, regardless of the place of delivery. Among the deaths to babies delivered in hospital, around three quarters also died in hospital, including 90 (79 percent) of 114 neonates whose illness began in their delivery hospital and who died without ever leaving. All cases aged 0-1 day in Serang and Jember who were born in hospitals died in hospitals. Three-quarters of the mothers had a delivery complication associated with the

neonatal cause of death. Outside the hospital, approximately one-fifth of neonates whose illness began in a health center where they were born, and one-fourth of babies who were delivered at home without a skilled attendant also had an associated delivery complication. The most common complications reported were preterm labor, prolonged labor, antepartum hemorrhage and fever. Nearly one-third of hospital births among cases were attended by personnel other than a doctor, and only three percent of the 75 births at a lower level facility were attended by a doctor.

CONCLUSION: The findings show that women with a delivery complication were more likely to deliver in a hospital than women without a complication, yet these complications contributed to a high level of early neonatal mortality.

RECOMMENDATION: Hospitals and other facilities that conduct deliveries must be better prepared for managing obstetric complications. All referral hospitals should have at least one trained obstetrician on staff to conduct complicated deliveries and supervise less highly trained personnel or have a clear and timely referral pathway installed to ensure quick and sufficient emergency care. Standard procedures for the diagnosis and management of the main delivery complications should be developed or adapted from WHO guidelines and barriers to the effective implementation of existing national guidelines should be addressed, and training sessions in the procedures conducted for all obstetric staff. Refresher sessions should be held on a regular basis. Training should also be conducted for staff at *puskesmas* and other facilities that conduct deliveries, and women in labor who present with or develop a complication while at the facility should be stabilized to the degree possible and urgently referred to a hospital.

STUDY FINDING: Three-fourths of the mothers of deceased neonates who had delivery complications and whose neonates' illness started at the delivery hospital, first sought care for their complications at up to three other facilities. Similarly, about a third of the women with a delivery complication that started at a lower-level facility first sought care for their complication at one to three other facilities. This contributed to a median delay in reaching delivery hospitals and other facilities of, respectively, two hours and half an hour. Women who delivered at hospitals and health facilities reported that they had decided to seek care with a median delay, respectively, of one minute and 18 minutes after noticing their symptoms.

CONCLUSION: The delay in women arriving at a facility where appropriate care could be provided could potentially have been critical to the loss of these neonates who died so soon after birth. Delay 1, the decision to seek care, did not appear to be a significant factor in these cases.

RECOMMENDATION: Steps are needed to address problems with the referral system identified by the EMNC study. Staff of sub-hospital-level facilities that conduct deliveries should be trained in urgent assessment and referral of women who arrive in labor with or develop complications while at the center. They should know the appropriate facilities to refer women to that can manage delivery complications and are readily accessible.

A rapid communication method should be established whereby health center personnel can contact the nearest referral hospital, notify obstetric staff of the referral, determine whether the hospital can receive the patient or if she needs to be sent elsewhere, and inform them of the woman's condition and treatments already implemented. Ambulance service should be provided as part of the referral system to ensure that these patients urgently reach the appropriate facility. The communication and referral

system should extend to ready access of health centers and hospitals conducting deliveries to PONEK hospitals when required.

STUDY FINDING: Thirteen and 12 neonates whose illness began, respectively, at the hospital and lower-level facility where they were delivered were referred but died before leaving the facility. The median time from delivery to referral was, respectively, ten and 1.2 hours. In another eight and ten cases who left their delivery hospital and other facility alive but were not referred, three-fourths and two-thirds, respectively, were still moderately or severely ill when they left. Sixteen and 41 who left a hospital and lower level facility alive were referred, but, respectively, a median time of 16.8 and 0.5 hours after delivery. This problem was also evident, to a lesser degree, at lower level facilities where mothers sought care for their neonates from home. Two of 37 such neonates died before leaving the facility that referred them, and 8 of 15 were sent home without a referral still moderately or severely ill.

CONCLUSION: Once delivered, neonates whose fatal illness began in the delivery facility, especially at hospital, may have received sub-optimal care in terms of rapid assessment and needed referral.

RECOMMENDATION: Training should be conducted for staff at hospitals, *puskesmas* and other facilities that conduct deliveries and care for sick children in assessing illness severity and determining when a sick neonate (or older child) requires urgent referral to a higher level of care. The WHO/UNICEF IMCI guidelines are a readily available and widely accepted resource that can help achieve this purpose. While IMCI has been underway in Indonesia since 1997, a 2014 study found several barriers to its effective implementation in *puskesma*s in West Java, including inadequate supervision by district health staff [54]. The 2014 study and others have shown that good training is insufficient to produce desired results—monitoring and supervision are also required to maintain acceptable health worker performance. This study and other available resources should be used to help guide needed improvements in health facility operations to improve the care of sick neonates, including making more timely and appropriate referrals.

STUDY FINDING: Neonates in the EMNC study most frequently died from prematurity and birth asphyxia on the first day or later in the first week. Many neonates also perished from these conditions in the second to fourth weeks of the neonatal period. Neonatal sepsis and pneumonia were other important causes of neonatal death beyond the first week of life.

CONCLUSION: While not all neonatal mortality is preventable, the leading causes of death among neonates in the study were, to some extent, preventable, manageable or treatable.

RECOMMENDATION: Timely assessment, optimal care and referral when needed are especially critical for the sickest neonates. Together with a trained obstetrician, all referral hospitals should have at least one trained pediatrician, preferably a neonatologist and/or a neonatal nurse, on staff. Pediatric staff should be on call for complicated deliveries and present in the delivery room to provide immediate assessment and management of sick neonates. Just as with obstetricians, pediatricians should supervise less highly trained personnel. Standard procedures for the assessment, management and referral when needed of sick newborns should be implemented, and training sessions in the procedures conducted for all pediatric staff. Refresher sessions should be held on a regular basis. All staff, including those at sub-hospital-level centers should be trained in and capable of resuscitating asphyxiated newborns and be knowledgeable of the basic care of premature newborns, including immediate respiratory and thermal management. Kangaroo mother care can be implemented for near-term and medically stable moderate

preterm neonates even in sub-hospital facilities. Premature newborns with breathing problems require rapid assessment and referral for possible administration of surfactant if the delivery facility does not have this capability. Other special equipment, supplies and knowledge are required to care for the most premature newborns, who will likely require care by a PONEK hospital. All health workers in hospitals and lower-level facilities who care for sick neonates should also be trained in the assessment, management and when to refer neonates with suspected sepsis or pneumonia.

To help prevent neonatal deaths beyond the first day and week, it is recommended to strengthen the policy to hold newborns in the hospital or other delivery facilities for at least 24 hours postpartum to ensure that their condition is good when they leave the facility. All newborns should be examined before departing to check for mother-newborn bonding including successful breastfeeding, the newborn's temperature, breathing, condition of the umbilical cord stump, etc. Mothers should be encouraged to bring their newborn to a health facility at ages 3- and 7-days for another check of their well-being and should be counselled on signs of neonatal illness to watch for and told where to bring their newborn if any illness signs appear.

5.4 RECOMMENDATIONS FOR VASA

Potential areas that can be improved:

- Adding questions on hour of birth and death may need to be considered, especially in areas where facility-based deliveries and access to health care are good, and secondary data are available to be reviewed.
- In areas where the community face many barriers to referral, adding more questions to understand the referral pathway and barriers in each referral point is worth considering.
- Adding questions about the length of stay in each facility and length of time from one facility to another until the last facility would be useful to examine delay in accessing and receiving care in more detail.
- In the future, it would be useful to record source of information accommodating multiple respondents.
- Due to variation of the deceased's condition or situation prior to death, we cannot anticipate all problems that may occur in the field that need to be accommodated in the questionnaire or addressed during interviewer training. Thus, close monitoring is required during data collection. In addition, it is critical for interviewers to comprehend the questionnaire in relation to the objective of the study.
- Even though electronic-based data collection can significantly reduce potential human error on the one hand, on the other hand the level of complexity of the questionnaire requires routine data quality monitoring for validity of the data.

5.5 INSURANCE AND MATERNAL AND NEONATAL MORTALITY

The inclusion of questions on use of health insurance among the deceased yielded concerning findings. To begin with, we know that despite having it, women and their families often did not use their insurance when they first sought care for their situation, and more used health insurance at the last provider (when more than one provider was consulted).

For neonatal deaths, however, the use of health insurance differed between the two districts. As noted, 56 percent of mothers of deceased neonates in Serang had to spend money to access care, in addition to their insurance, compared to 21.3 percent in Jember. Yet nearly half of the neonates' mothers in Serang were covered by *JKN non-PBI* (47.7 percent), while many of the neonates' mothers in Jember were covered by either *JKN PBI-APBN* (20 percent) or *Jamkesda* (26.7 percent).

Among the deceased neonates who were taken for care at a formal provider during their fatal illness, about half did not use any health insurance when they were at the first provider (56.3 percent in Serang and 50.4 percent in Jember). The use of *JKN PBI-APBN* and *Jamkesda* among neonates at the first provider, which can be seen as equivalent to insurance for the poor, was higher in Jember (39.7 percent) than in Serang (16.7 percent). Once insurance is used, a complex picture emerges – particularly with neonates – that requires further analysis that is currently under way.

5.6 RECOMMENDATIONS FOR FUTURE RESEARCH

The EMNC study has led to important findings that have programmatic and policy implications to accelerate reduction of maternal and neonatal deaths. This study, however, has also uncovered some areas that need further research. Among those areas is the quality of care at both primary level of care and hospital to identify areas of care that require improvement and how resources could be effectively allocated for this purpose. Such research should cover the capacity of health providers in providing adequate care and making correct clinical judgement, and capacity of health facilities to provide comprehensive emergency maternal and neonatal care. This is also the gap in the body of literature, particularly for the Indonesia setting. The unpredictability of most life-threatening complications, despite being treatable, demands 24/7 accessible quality of care. Although this study was not designed to provide information on quality of care, it indicates problems with quality of care at all levels.

Furthermore, our study has not comprehensively assessed the referral practice particularly in relation to NHI. Even though we do not have hard data, during interviews there were some indications of uncertainty from both the families and primary care level provider about the coverage of NHI. This could definitely influence care seeking, especially referral, and eventually affect outcomes of the illness. A study on referral practice will complement the study of quality of care above to give an overall picture of how unpredicted complication can be managed timely and adequately.

Lastly, once more analysis on the role and use of health insurance has been completed, the results could provide input into a population-based study that includes a control group and focuses primarily on the impact and dynamics of insurance usage in the context of the persistent high rates of maternal and neonatal death.

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7. APPENDIX: ADDITIONAL RESULTS TABLES

TABLE 50. MATERNAL INSURANCE *BPJS NON-PBI* COVERAGE BY TIME OF DEATH

Time of death	Insurance *BPJS non-PBI coverage*		
	Yes (n=16)	No (n=87)	Total (n=103)
	Row %	Row %	Row %
During pregnancy	8.0	92.0	100.0
At delivery	9.1	90.9	100.0
First 24 hr postpartum	19.2	80.8	100.0
Day 2 postpartum	0.0	100.0	100.0
3-7 days postpartum	7.7	92.3	100.0
8-42 days postpartum	26.9	73.1	100.0

TABLE 51. ANC VISIT AMONG MATERNAL DEATHS BY SES

Characteristics	SES				Total
	Q1	Q2	Q3	Q4	
ANC visit(s)	**n=19**	**n=25**	**n=22**	**n=37**	**n=103**
	%	%	%	%	%
Received ANC	100.0	92.0	100.0	83.8	92.2
Type of ANC providers	**n=19**	**n=23**	**n=22**	**n=31**	**n=95**
	%	%	%	%	%
ANC by health providers	100.0	100.0	100.0	100.0	100.0
TBA	0.0	13.0	27.3	12.9	13.7
Other non-health providers	0.0	13.0	27.3	12.9	13.7
Health provider seen during ANC visits	**n=19**	**n=23**	**n=22**	**n=31**	**n=95**
	%	%	%	%	%
Village midwife	47.4	69.6	63.6	74.2	65.3
Puskesmas midwife	73.7	47.8	63.6	51.6	57.9
Private midwife	63.2	30.4	63.6	38.7	47.4
Unspecified midwife	0.0	4.3	0.0	0.0	1.1
General practitioner/obstetrician	52.6	30.4	50.0	29.0	38.9
Nurse	0.0	4.3	0.0	0.0	1.1
Midwife in hospital	10.5	4.3	4.5	3.2	5.3
Other health provider	0.0	0.0	4.5	0.0	1.1
Number of ANC visits	**n=19**	**n=23**	**n=22**	**n=31**	**n=95**
	%	%	%	%	%
1-3 times	5.3	17.4	13.6	16.1	13.7
4 and more	89.5	73.9	81.8	74.2	78.9
Don't know	5.3	8.7	4.5	9.7	7.4
Had at least one time ANC by trimester	**n=19**	**n=23**	**n=22**	**n=31**	**n=95**
	%	%	%	%	%
First trimester	84.2	69.6	86.4	74.2	77.9
Second trimester	89.5	82.6	86.4	77.4	83.2
Third trimester	84.2	65.2	72.7	77.4	74.7
	n=10	**n=14**	**n=10**	**n=19**	**n=53**
	%	%	%	%	%
Had 4 ANC visits - sequence of 1, 1, 2 of those with gestational age ≥ 9 months	80.0	42.9	90.0	73.7	69.8
	n=19	**n=23**	**n=22**	**n=31**	**n=95**
	%	%	%	%	%
Had expense for ANC	47.4	26.1	45.5	35.5	37.9
	n=8	**n=6**	**n=7**	**n=8**	**n=29**
	%	%	%	%	%
Median of out of pocket expenses in rupiah for last ANC visit	30.000	30.000	75.000	25.000	40.000

FIGURE 16. RECEIVED OF ANC COMPONENTS OF THOSE WITH ANY ANC VISIT - MATERNAL

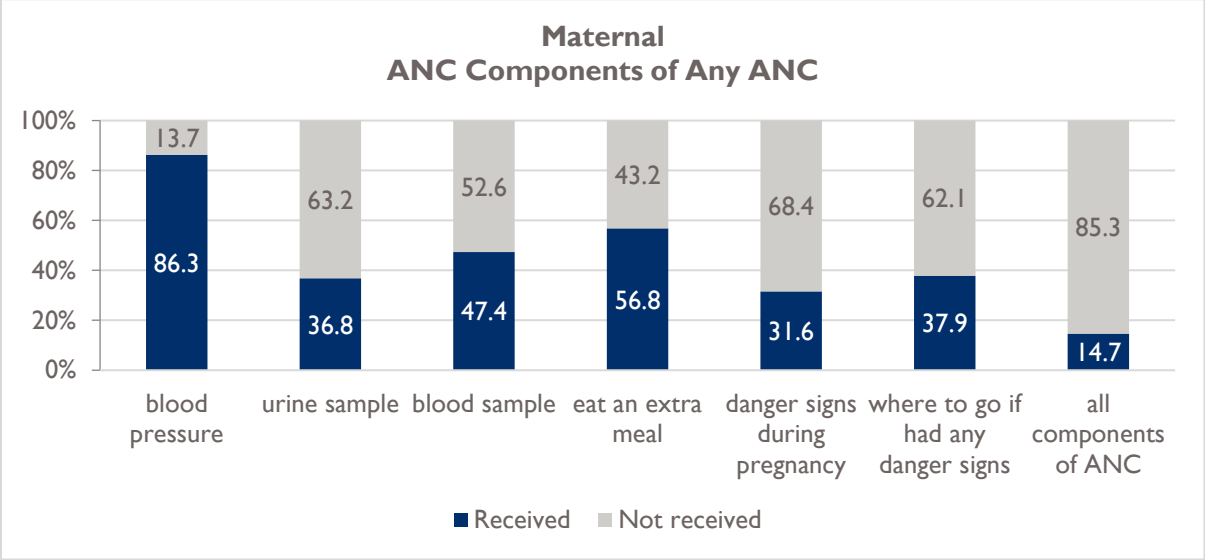

FIGURE 17. RECEIVED OF ANC COMPONENTS OF THOSE WITH 4 OR MORE ANC VISITS - MATERNAL

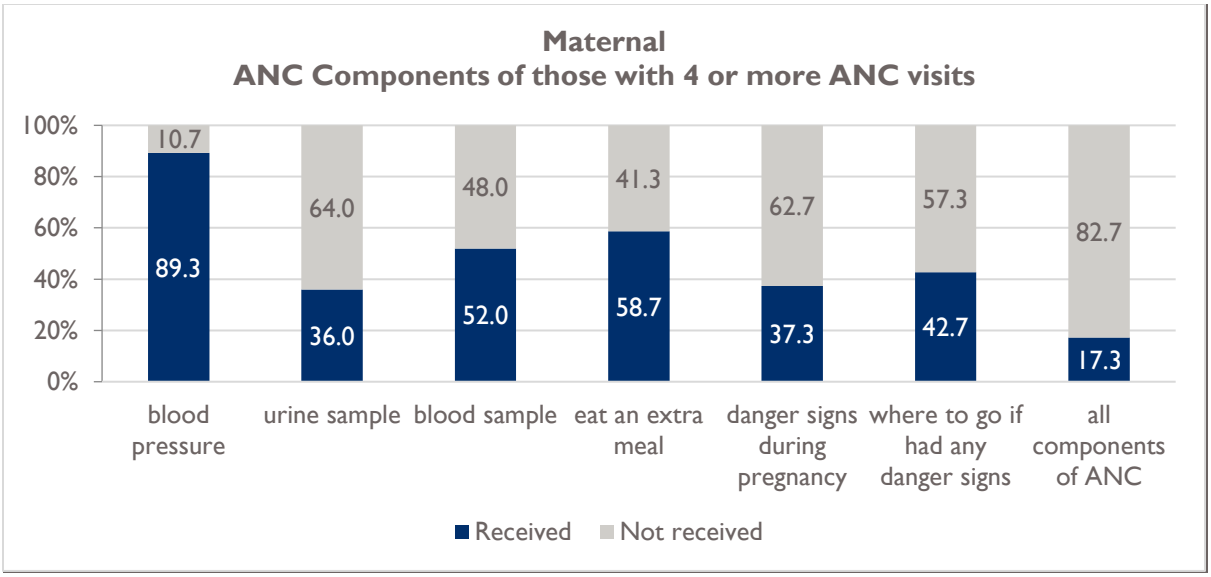

TABLE 52. MATERNAL COMPLICATIONS: DURING PREGNANCY OR LABOR/DELIVERY BY SES

Complications	SES				Total
	Q1	Q2	Q3	Q4	
Any time during pregnancy or labor/delivery	**n=19 %**	**n=25 %**	**n=22 %**	**n=37 %**	**n=103 %**
Preeclampsia	10.5	8.0	27.3	13.5	14.6
Maternal infection	10.5	0.0	4.5	5.4	4.9
Malaria	0.0	0.0	4.5	0.0	1.0
During pregnancy	**n=19 %**	**n=25 %**	**n=22 %**	**n=37 %**	**n=103 %**
High blood pressure	31.6	32.0	31.8	18.9	27.2
Antepartum haemorrhage	26.3	0.0	13.6	2.7	8.7
Had convulsions	5.3	8.0	13.6	5.4	7.8
Blurred vision	5.3	4.0	9.1	5.4	5.8
During labor/delivery (n=75)	**n=16 %**	**n=16 %**	**n=16 %**	**n=27 %**	**n=75 %**
Prolonged labor	12.5	31.3	37.5	14.8	22.7
Intrapartum haemorrhage	37.5	18.8	6.3	25.9	22.7

TABLE 53. LABOR DURATION FOR MATERNAL DEATHS BY SES

Characteristics	SES				Total
	Q1	Q2	Q3	Q4	
Labor duration (hours)	**n=16 %**	**n=16 %**	**n=16 %**	**n=27 %**	**n=75 %**
0-2	18.8	18.8	31.3	29.6	25.3
3-6	56.3	37.5	6.3	22.2	29.3
7-11	12.5	12.5	18.8	11.1	13.3
12-23	12.5	18.8	31.3	3.7	14.7
24-47	0.0	12.5	0.0	3.7	4.0
48+	0.0	0.0	6.3	3.7	2.7
NA	0.0	0.0	6.3	14.8	6.7
Don't know	0.0	0.0	0.0	11.1	4.0

TABLE 54. BIRTH AT HOSPITAL BY TIME OF DEATH – MATERNAL

Time of death	Birth at hospital		
	Yes	No	Total
	n=51 %	n=19 %	n=70 %
At delivery	5.9	15.8	8.6
First 24 hr postpartum	31.4	52.6	37.1
Day 2 postpartum	3.9	0.0	2.9
3-7 days postpartum	23.5	5.3	18.6
8-42 days postpartum	35.3	26.3	32.9

TABLE 55. FACTORS RELATED TO CARE SEEKING CONSTRAINTS FOR FIRST PROVIDER BY SES – MATERNAL

Characteristics	SES				Total
	Q1	Q2	Q3	Q4	
Constraints to care-seeking	n=2 %	n=2 %	n=4 %	n=6 %	n=14 %
Did not think she was sick enough	0.0	0.0	25.0	0.0	7.1
Too much time from her/caregiver's duties	50.0	0.0	0.0	0.0	7.1
Too far to travel	0.0	0.0	25.0	0.0	7.1
Cost (transport, healthcare, other)	0.0	0.0	0.0	16.7	7.1
Not satisfied with available healthcare	50.0	100.0	0.0	0.0	21.4
Too sick to travel	0.0	0.0	50.0	50.0	35.7
Other issue	50.0	50.0	0.0	16.7	21.4

TABLE 56. CAUSES OF DEATHS BY TYPE OF FIRST PROVIDER OR FACILITY, AMONG WOMEN DIED DURING WITHIN 2-42 DAYS POSTPARTUM

	Type of first provider or facility							
	Government hospital	Private hospital	*Puskesmas*	Private doctor/ clinic	Private practice midwives	Government health post	Trained midwife* (public sector)	Trained midwife* (private medical sector)
	%	%	%	%	%	%	%	%
Pregnancy-related sepsis (n=9)	22.2	11.1	22.2	0.0	11.1	0.0	22.2	11.1
Pregnancy-induced hypertension (n=6)	16.7	16.7	16.7	0.0	16.7	0.0	16.7	16.7
Obstetric haemorrhage (n=5)	20.0	60.0	0.0	0.0	0.0	0.0	20.0	0.0
Other and unspecified cardiac disease (n=4)	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0
Acute respiratory infection, including pneumonia (n=3)	33.3	0.0	33.3	33.3	0.0	0.0	0.0	0.0
Ruptured uterus (n=2)	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Abortion-related death (n=2)	0.0	0.0	0.0	50.0	0.0	50.0	0.0	0.0
Acute cardiac disease (n=1)	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Anaemia of pregnancy (n=1)	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Diarrhoeal diseases (n=1)	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Digestive neoplasms (n=1)	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Liver cirrhosis (n=1)	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Road traffic accident (n=1)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	21.6	13.5	29.7	8.1	5.4	2.7	13.5	5.4

**care were sought outside a health facility*

TABLE 57. CAUSES OF DEATHS BY TYPE OF LAST PROVIDER/ FACILITY, AMONG WOMEN DIED DURING WITHIN 2-42 DAYS POSTPARTUM

	Type of last provider or facility			
	Government hospital	Puskesmas	Private hospital	Trained midwife* (private medical sector)
	%	%	%	%
Pregnancy-related sepsis (n=7)	85.7	0.0	0.0	14.3
Pregnancy-induced hypertension (n=6)	83.3	0.0	16.7	0.0
Obstetric haemorrhage (n=4)	100.0	0.0	0.0	0.0
Other and unspecified cardiac disease (n=2)	100.0	0.0	0.0	0.0
Ruptured uterus (n=2)	100.0	0.0	0.0	0.0
Anaemia of pregnancy (n=1)	100.0	0.0	0.0	0.0
Abortion-related death (n=1)	100.0	0.0	0.0	0.0
Acute cardiac disease (n=1)	0.0	100.0	0.0	0.0
Diarrhoeal diseases (n=1)	100.0	0.0	0.0	0.0
Digestive neoplasms (n=1)	100.0	0.0	0.0	0.0
Liver cirrhosis (n=1)	0.0	0.0	100.0	0.0

**care were sought outside a health facility*

FIGURE 18. RECEIVED OF ANC COMPONENTS OF THOSE WITH ANY ANC VISIT – NEONATES

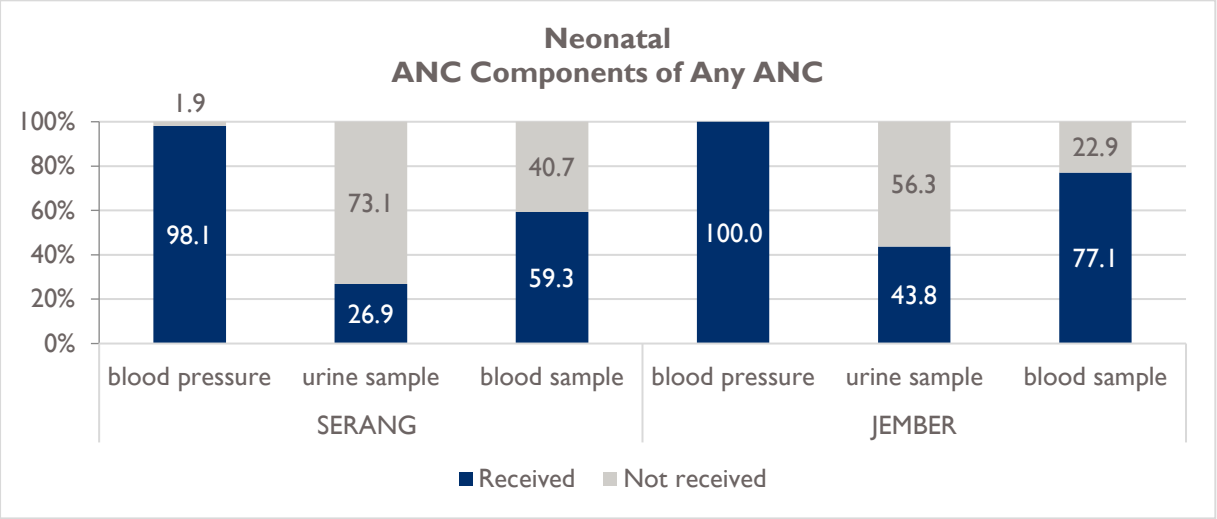

FIGURE 19. RECEIVED OF ANC COMPONENTS OF THOSE WITH ANY ANC VISIT IN SERANG - NEONATES

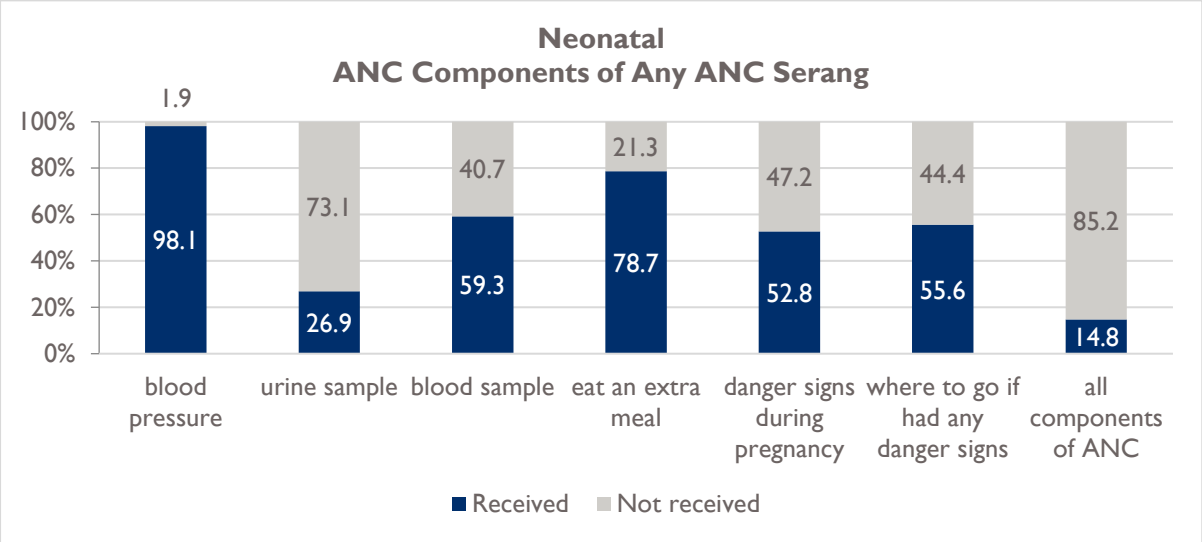

FIGURE 20. RECEIVED OF ANC COMPONENTS OF THOSE WITH ANY ANC VISIT IN JEMBER - NEONATES

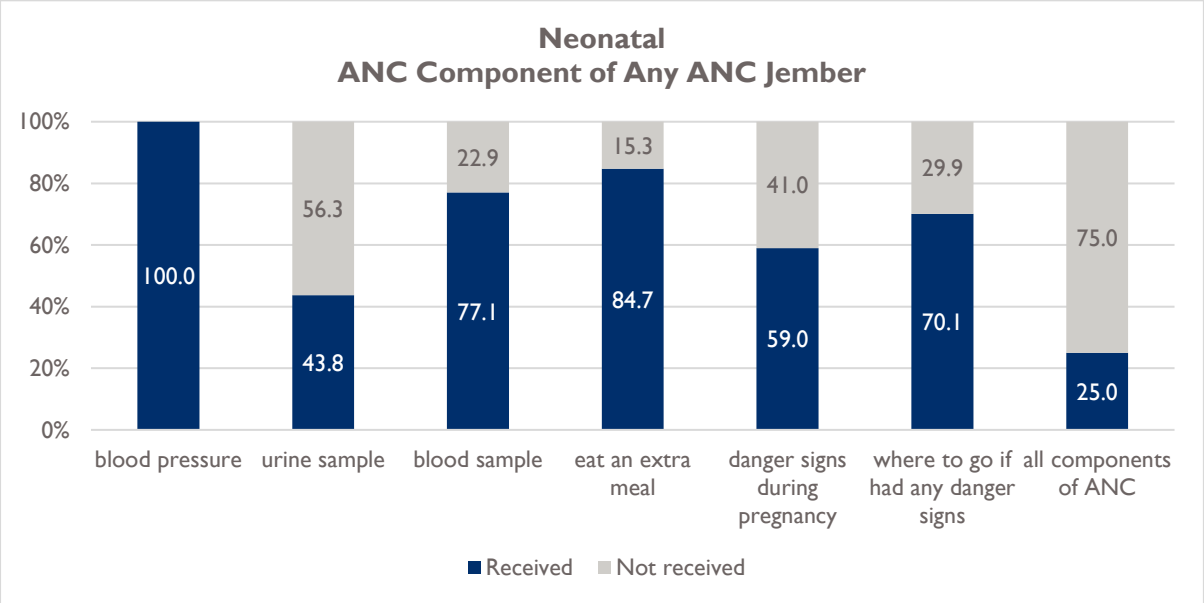

FIGURE 21. RECEIVED OF ANC COMPONENTS OF THOSE WITH 4 OR MORE ANC VISITS – NEONATES

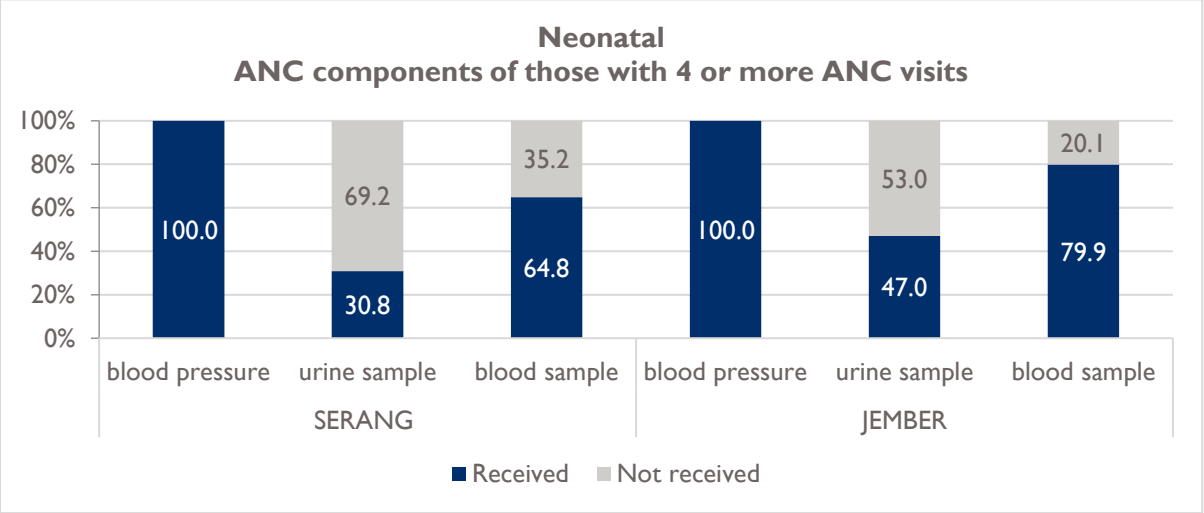

FIGURE 22. RECEIVED OF ANC COMPONENTS OF THOSE WITH 4 OR MORE ANC VISITS – NEONATES SERANG

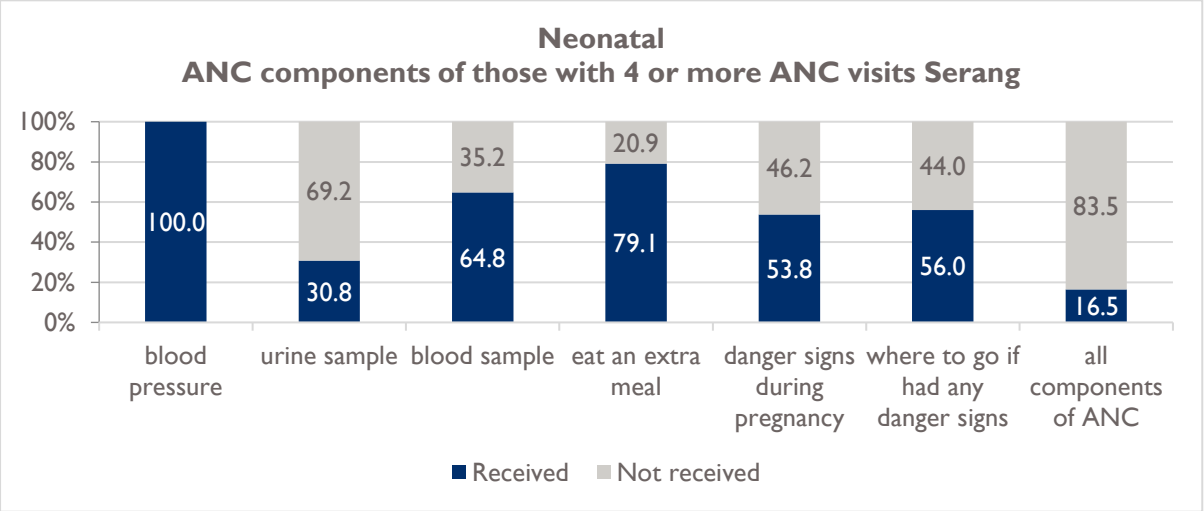

FIGURE 23. ANC COMPONENTS OF THOSE WITH 4 OR MORE ANC VISITS – NEONATES, JEMBER

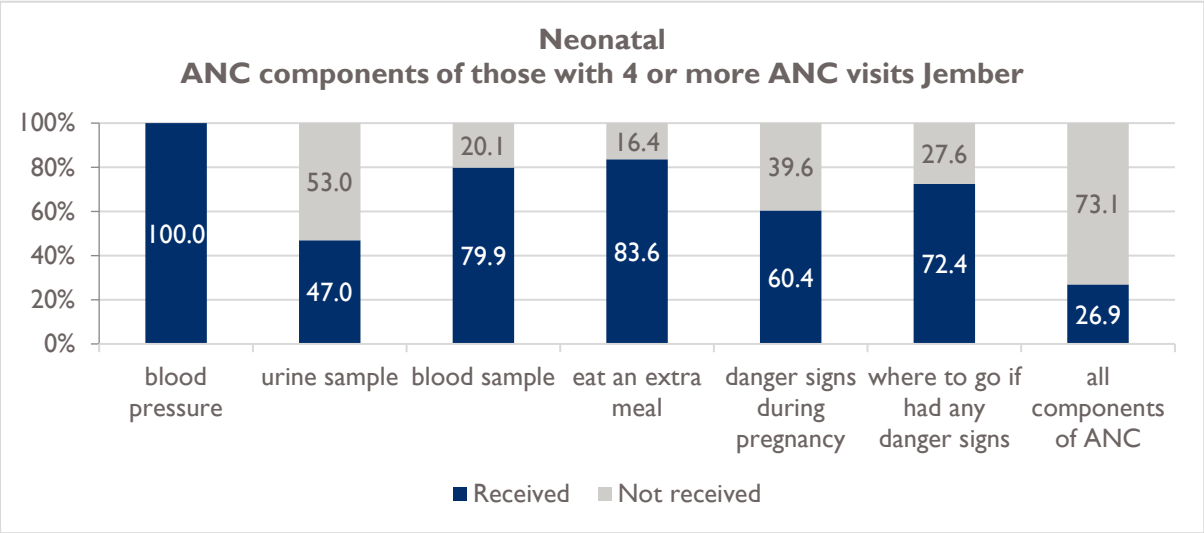

TABLE 58. NEONATAL PLACE OF DELIVERY & DEATH STRATIFIED BY CONDITION WHEN LEAVING THE FACILITY, SERANG

(Id10058) Where did the deceased die?	(Id10360) Where was the deceased born? And (Q5089) Did the baby leave the delivery facility alive or did s/he die in the facility?											
	hospital				other health facility				Total			
	left alive		died in the facility		left alive		died in the facility		left alive		died in the facility	
	n	%	n	%	n	%	n	%	n	%	n	%
hospital	2	18.2	34	100.0	11	44.0	1	7.1	13	36.1	35	72.9
other health facility	0	0.0	0	0.0	2	8.0	13	92.9	2	5.6	13	27.1
home	8	72.7	0	0.0	11	44.0	0	0.0	19	52.8	0	0.0
on route to hospital or facility	1	9.1	0	0.0	1	4.0	0	0.0	2	5.6	0	0.0
Total	**11**	**100.0**	**34**	**100.0**	**25**	**100.0**	**14**	**100.0**	**36**	**100.0**	**48**	**100.0**

TABLE 59. NEONATAL PLACE OF DELIVERY & DEATH STRATIFIED BY CONDITION WHEN LEAVING THE FACILITY, JEMBER

(Id10058) Where did the deceased die?	(Id10360) Where was the deceased born? And (Q5089) Did the baby leave the delivery facility alive or did s/he die in the facility?											
	hospital				other health facility				Total			
	left alive		died in the facility		left alive		died in the facility		left alive		died in the facility	
	n	%	n	%	n	%	n	%	n	%	n	%
hospital	15	78.9	56	100.0	29	63.0	0	0.0	44	67.7	56	84.8
other health facility	0	0.0	0	0.0	1	2.2	10	100.0	1	1.5	10	15.2
home	3	15.8	0	0.0	15	32.6	0	0.0	18	27.7	0	0.0
on route to hospital or facility	1	5.3	0	0.0	1	2.2	0	0.0	2	3.1	0	0.0
Total	**19**	**100.0**	**56**	**100.0**	**46**	**100.0**	**10**	**100.0**	**65**	**100.0**	**66**	**100.0**

TABLE 60. NEONATAL PREGNANCY COMPLICATIONS AND FORMAL CARE SEEKING BY SES

Characteristics	Serang - SES					Jember - SES					Total
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	
Pregnancy complications	n=24 %	n=35 %	n=24 %	n=26 %	n=109 %	n=48 %	n=33 %	n=34 %	n=35 %	n=150 %	n=259 %
Antepartum hemorrhage	4.2	5.7	8.3	0.0	4.6	4.2	6.1	5.9	11.4	6.7	5.8
Convulsions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.7	0.4
Blurred vision	4.2	5.7	8.3	11.5	7.3	6.3	0.0	2.9	11.4	5.3	6.2
High blood pressure	12.5	8.6	16.7	15.4	12.8	14.6	6.1	14.7	14.3	12.7	12.7
Foul smelling discharge	8.3	0.0	8.3	0.0	3.7	2.1	9.1	2.9	2.9	4.0	3.9
Care-seeking from health provider	n=6 %	n=6 %	n=4 %	n=5 %	n=21 %	n=10 %	n=5 %	n=11 %	n=9 %	n=35 %	n=56 %
Polindes (midwife, for childbirth)	16.7	0.0	0.0	0.0	4.8	0.0	0.0	9.1	22.2	8.6	7.1
Puskesmas	16.7	50.0	50.0	60.0	42.9	60.0	20.0	36.4	66.7	48.6	46.4
Private practice midwife	16.7	0.0	25.0	20.0	14.3	30.0	20.0	54.5	33.3	37.1	28.6
Private clinic	50.0	50.0	50.0	0.0	38.1	40.0	0.0	45.5	11.1	28.6	32.1
Hospital	66.7	50.0	75.0	60.0	61.9	60.0	20.0	36.4	44.4	42.9	50.0
Health provider seen at the other place	16.7	16.7	0.0	0.0	9.5	0.0	40.0	36.4	11.1	20.0	16.1

TABLE 61. NEONATAL LABOR/DELIVERY COMPLICATION AND LABOR DURATION BY SES

Characteristics	Serang					Jember					Total
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	
Labor/delivery complications	**n=24** %	**n=35** %	**n=24** %	**n=26** %	**n=109** %	**n=48** %	**n=33** %	**n=34** %	**n=35** %	**n=150** %	**n=259** %
Preterm labor (Pregnancy less than 9 months)	62.5	51.4	54.2	57.7	56.0	41.7	33.3	44.1	40.0	40.0	46.7
Prolonged labor (Labor 12 hours or more)	29.2	20.0	45.8	15.4	26.6	39.6	24.2	44.1	28.6	34.7	31.3
High blood pressure	4.2	5.7	12.5	11.5	8.3	16.7	6.1	8.8	20.0	13.3	11.2
Labor duration (hours)	**n=24** %	**n=35** %	**n=24** %	**n=26** %	**n=109** %	**n=48** %	**n=33** %	**n=34** %	**n=35** %	**n=150** %	**n=259** %
0-2	33.3	45.7	25.0	15.4	31.2	27.1	42.4	29.4	17.1	28.7	29.7
3-6	25.0	22.9	20.8	50.0	29.4	12.5	15.2	14.7	31.4	18.0	22.8
7-11	12.5	11.4	8.3	19.2	12.8	20.8	18.2	11.8	22.9	18.7	19.7
12-23	16.7	14.3	45.8	11.5	21.1	25.0	12.1	26.5	17.1	20.7	18.5
24-47	8.3	5.7	0.0	3.8	4.6	6.3	9.1	14.7	2.9	8.0	5.4
48+	4.2	0.0	0.0	0.0	0.9	8.3	3.0	2.9	8.6	6.0	3.9

TABLE 62. NEONATAL CARE-SEEKING CONSTRAINTS BY SES

Characteristics	Serang					Jember					Total
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	
	n=24 %	n=35 %	n=24 %	n=26 %	n=109 %	n=48 %	n=33 %	n=34 %	n=35 %	n=150 %	n=259 %
Not delivering at or attempting to deliver at a formal provider/facility	12.5	17.1	16.7	3.8	12.8	2.1	6.1	0.0	5.7	3.3	7.3
	n=3 %	**n=7 %**	**n=5 %**	**n=2 %**	**n=17 %**	**n=2 %**	**n=8 %**	**n=1 %**	**n=4 %**	**n=15 %**	**n=32 %**
Care seeking constraints to deliver with a formal provider (If she did not deliver or try to deliver with a health provider or facility)	100.0	85.7	80.0	50.0	82.4	50.0	25.0	0.0	50.0	33.3	59.4
Issue Care seeking constraints to deliver with a formal provider (Q30031)	**n=3 %**	**n=6 %**	**n=4 %**	**n=1 %**	**n=14 %**	**n=1 %**	**n=2 %**	**n=0 %**	**n=2 %**	**n=5 %**	**n=19 %**
Did not think she was sick enough	0.0	16.7	0.0	100.0	14.3	0.0	0.0	0.0	0.0	0.0	10.5
No one available to go with her	33.3	16.7	0.0	100.0	21.4	0.0	0.0	0.0	0.0	0.0	15.8
Too far to travel	33.3	16.7	25.0	100.0	28.6	0.0	50.0	0.0	50.0	40.0	31.6
No transportation available	66.7	0.0	25.0	0.0	21.4	0.0	0.0	0.0	50.0	20.0	21.1
Cost	33.3	50.0	0.0	100.0	35.7	100.0	0.0	0.0	0.0	20.0	31.6
Too sick to travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	20.0	5.3
Thought he/she will die despite care	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	20.0	5.3
Was late at night	33.3	0.0	25.0	0.0	14.3	0.0	0.0	0.0	0.0	0.0	10.5
Problem with health insurance	0.0	0.0	0.0	100.0	7.1	0.0	0.0	0.0	0.0	0.0	5.3
Other issue	33.3	16.7	25.0	0.0	21.4	0.0	50.0	0.0	0.0	20.0	21.1
	n=21 %	n=28 %	n=19 %	n=24 %	n=92 %	n=46 %	n=25 %	n=33 %	n=31 %	n=135 %	n=227 %
Care seeking constraints to deliver with a formal provider (If she delivered with or was on route a health provider or facility for delivery)	42.9	39.3	36.8	37.5	39.1	19.6	28.0	30.3	22.6	24.4	30.4
Issue care seeking constraints to deliver with a formal provider	**n=9 %**	**n=11 %**	**n=7 %**	**n=9 %**	**n=36 %**	**n=9 %**	**n=7 %**	**n=10 %**	**n=7 %**	**n=33 %**	**n=69 %**
Did not think she was sick enough	0.0	9.1	0.0	0.0	2.8	0.0	0.0	10.0	14.3	6.1	4.3
No one available to go with her	0.0	0.0	0.0	0.0	0.0	0.0	14.3	10.0	0.0	6.1	2.9

Someone else had to decide	0.0	0.0	28.6	11.1	8.3	0.0	0.0	10.0	0.0	3.0	5.8
Too far to travel	22.2	0.0	28.6	22.2	16.7	0.0	14.3	10.0	0.0	6.1	11.6
No transportation available	0.0	9.1	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	1.4
Cost	0.0	36.4	71.4	33.3	33.3	33.3	14.3	10.0	42.9	24.2	29.0
Not satisfied with available healthcare	0.0	9.1	0.0	0.0	2.8	0.0	0.0	20.0	0.0	6.1	4.3
Too sick to travel	0.0	18.2	0.0	0.0	5.6	11.1	14.3	0.0	0.0	6.1	5.8
Thought he/she will die despite care	0.0	0.0	0.0	0.0	0.0	11.1	14.3	0.0	14.3	9.1	4.3
Problem with health insurance	11.1	0.0	14.3	22.2	11.1	11.1	0.0	0.0	0.0	3.0	7.2
Other issue	44.4	27.3	28.6	22.2	30.6	55.6	28.6	50.0	28.6	42.4	36.2

TABLE 63. NEONATAL SUMMARY OF DELAY IN HEALTH CARESEEKING – SERANG

Characteristic	Yes n	No n	Total n	Time to/at first provider (mean/median)	Total time at first provider (mean/median)
Sought formal health care	19	7	26		
who did not seek formal care					
Provided home care only	3	23	26		
Sought traditional care only	3	23	26		
First delay (n=26)					
All who sought formal care				8.49 / 0.25 hrs	
Sought informal care first*	11	15	26	30.09 / 11 hrs	
Sought formal care first	15	11	26	2.73 / 0.02 hrs	
Second delay (n=14)					
All who sought formal care and left the first facility alive				1.95 / 1 hrs	0.11 / 0.02 hrs
Went to one provider	8	6	14	0.74 /0.83 hrs	
Went to more than one provider	6	8	14	3.36 / 2.0 hrs	0.23 / 0.02 hrs
Went to other provider before *PONEK*	2	6	8		
Proxy of third delay◊ (n=8) All who received care from at least one *PONEK hospital*					
Went from *PONEK* to *PONEK*	2	6	8		

Note: table excludes 77 neonates who were born and died in the same facility, no info where illness started, no info on birth attendant.
**Informal care includes home care, traditional care and care from a pharmacist/drug seller.*
◊Delay three could not answered from tool used in EMNC study. However, of cases who reached PONEK hospital and referred elsewhere indicate that even PONEK hospital could not provide adequate care.

TABLE 64. NEONATAL SUMMARY OF DELAY IN HEALTH CARESEEKING – JEMBER

Characteristic	Yes n	No n	Total n	Time to/at first provider (mean/median)	Total time at first provider (mean/median)
Sought formal health care	27	4	31		
who did not seek formal care					
Provided home care only	1	30	31		
Sought traditional care only	3	28	31		
First delay (n=31)					
All who sought formal care and left the first facility alive				6.29 / 1.0 hrs	
Sought informal care first*	11	20	31	15.33 / 4.5 hrs	
Sought formal care first	20	11	31	3.57 / 0.42 hrs	
Second delay (n=23)					
All who sought formal care				0.41 / 0.29 hrs	0.01 / 0.0 hrs
Went to one provider	9	14	23	0.25 / 0.25 hrs	
Went to more than one provider	14	9	23	0.49 / 0.5 hrs	0.01 / 0.0 hrs
Went to other provider before *PONEK*	7	2	9		
Proxy of third delay◊ (n=9) All who received care from at least one *PONEK hospital*					
Went from *PONEK* to *PONEK*	1	8	9		

Note: table excludes 114 neonates who were born and died in the same facility, no info where illness started, no info on birth attendant.

*Informal care includes home care, traditional care and care from a pharmacist/drug seller.

◊Delay three could not answered from tool used in EMNC study. However, of cases who reached *PONEK* hospital and referred elsewhere indicate that even *PONEK* hospital could not provide adequate care.

TABLE 65. CAUSE OF NEONATAL DEATH BY AGE OF DEATH IN SERANG

Cause with rank: 1	Age in days at death				
	0 day	1-6 days	7-27 days	Total	n
	n=34 %	n=53 %	n=22 %	n=109 %	
Accid fall	5.9	0.0	0.0	1.8	2
Birth asphyxia	8.8	32.1	18.2	22.0	24
Congenital malformation	0.0	1.9	4.5	1.8	2
Neonatal pneumonia	0.0	1.9	27.3	6.4	7
Prematurity	85.3	64.2	50.0	67.9	74

TABLE 66. CAUSE OF NEONATAL DEATH BY AGE OF DEATH IN JEMBER

Cause with rank: 1	Age in days at death				
	0 day	1-6 days	7-27 days	Total	n
	n=54 %	n=63 %	n=33 %	n=150 %	
Acute resp infect incl pneumonia	0.0	0.0	3.0	0.7	1
Birth asphyxia	14.8	19.0	9.1	15.3	23
Congenital malformation	0.0	1.6	6.1	2.0	3
Neonatal pneumonia	0.0	7.9	24.2	8.7	13
Neonatal sepsis	0.0	3.2	9.1	3.3	5
Prematurity	83.3	66.7	48.5	68.7	103
Road traffic accident	1.9	1.6	0.0	1.3	2

FIGURE 24. CAUSE OF NEONATAL DEATH BY TIME OF DEATH IN SERANG

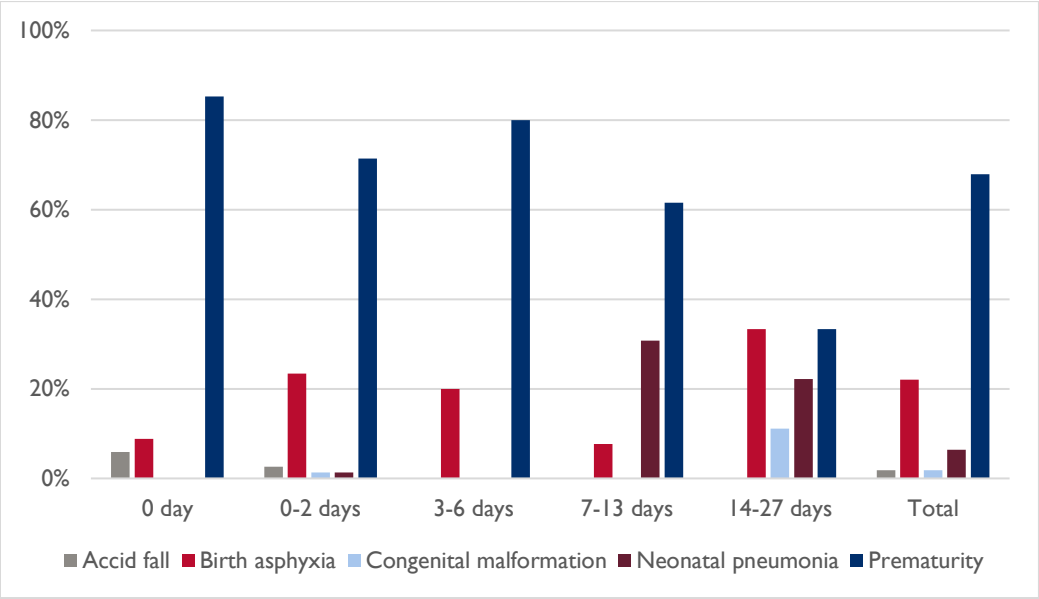

FIGURE 25. CAUSE OF NEONATAL DEATH BY TIME OF DEATH IN JEMBER