COVID-19 Indonesia Social Media Monitoring

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Contributions from Maham Khan, Nick Jones (GFDRR) and Kai Kaiser (Governance GP)

1 June 2020
This is an activity under the COVID-19 Observatory in partnership with the Poverty GP

We also draw from big data sources on mobility and remotely sensed information
WHY USE SOCIAL MEDIA?

- **Inform**: obtain policy relevant information for decision makers at national and local levels
- **Content**: citizens’ understanding of the pandemic, the behaviors it triggers, sentiments towards government as well as rising concerns
- **Speed**: rapid monitoring, initial results available early May
- **Breadth**: 90% of Indonesians 170m internet users on SM
- **Value**: low cost relative to traditional methods: example per unit survey costs below 5 cents, big data collection free, costs are related to analysis time and computational resources
WHAT WE DID

- Monitoring conversations via social media and online news
- Crowdsourcing citizen information via online survey
- Comparing results across different data collection efforts
- Integrating with other big data analytics
WHAT WE KNOW SO FAR

• There is a high level of knowledge on COVID-19, with most respondents aware of common symptoms and preventative health measures. However, citizens face challenges in following these measures.

• Concerns related to COVID-19 have revolved around health care, food access, job loss and government handling. This matches own and other survey data.

• While the overall tone in the discussions on social media and in online news sources has been moderating, the government handling of the situation is widely discussed.
POLICY IMPLICATIONS

• Are there opportunities to make following preventative measures easier?

• Some anticipated concerns – food security, health access, job loss – are apparent. Need to monitor closely and unpack at subnational level to find appropriate entry points.

• Track if there are significant changes in tone of sentiment towards government. Are certain groups at greater risk of exclusion?
Methods Overview
Who? 440,000 Twitter users, 1.2M Instagram users, 220,000 online news articles, 3,300+ online survey respondents
How? Via comprehensive information collection and analysis approaches

Information collection

1. Collect posts with COVID related hashtags and geotag information since March 26th
   - >3mn tweets
   - >5mn posts

2. Extract COVID-19 related posts using GDELT repository of headlines
   - >200k articles
   - ~100 sources

Content analysis & insights generation

3. Google
   Compare online conversation with on-the-ground situation: online survey conducted from 20-Apr to 20-May

- Content analysis using:
  - Unsupervised Latent Dirichlet Allocation (LDA) to review trending topics
  - Word embedding methods to identify the volume of conversation on pre-identified topics
  - Apply ex-post survey weights to improve representativeness of sample
Robustness: cross-validation against other online survey data collection efforts

<table>
<thead>
<tr>
<th>Institution</th>
<th>Timeline</th>
<th>Methodology</th>
<th>Sample</th>
<th>Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREMISE</td>
<td>April 2, 2020 - now; Recurs every 3 days.</td>
<td>Utilize global network via PREMISE crowdsourcing data collection phone app; Dynamic monitoring of changes on weekly basis</td>
<td>2,749 Indonesian respondents (as of May 14, 2020)</td>
<td>Economics, social, health condition, concern about COVID-19</td>
</tr>
<tr>
<td>J-PAL</td>
<td>March 29, 2020 - now; Recurs every week.</td>
<td>Online using google survey, Used Susenas 2019 to create ex-post sample weights; Results are pooled unless otherwise stated</td>
<td>500 respondents every week, two groups: 1) 200 respondents aged 18+, 2) 300 respondents aged 35+</td>
<td>Employment, Food insecurity, Migration, Government assistance program, and Healthy lifestyle changes</td>
</tr>
<tr>
<td>BPS Online Survey</td>
<td>April 13-20, 2020</td>
<td>Online survey using social media ads to re-direct to BPS official website (TBC)</td>
<td>70,000+ (TBC)</td>
<td>Perception and personal behavior, Collective behavior, Wellbeing related to COVID, Economic impact, General (demographic)</td>
</tr>
<tr>
<td>THE UNIVERSITY OF WARWICK</td>
<td>March 20, 2020 - now</td>
<td>Online survey shared via various social networks; Website (covid19-survey.org); Results are weighted based by country-level weights</td>
<td>113,083 respondents worldwide; 1,618 respondents from Indonesia. (Dataset as of May 1, 2020)</td>
<td>Past and future behaviors, Personal attitudes about coronavirus measures, Perception about other's beliefs about coronavirus measures, Financial sanctioning of risky behaviors, Case predictions, Perceptions about government/public responses and efficacy; Worries battery; Depression questionnaire; Personality battery; Personal information</td>
</tr>
<tr>
<td>Int. Academic Research Consortium</td>
<td>April 20 – May 20, 2020</td>
<td>Online survey using 5 sets of questionnaire, each 10 questions; Target audiences by age group, gender, location; Used Susenas 2019 to create ex-post sample weights</td>
<td>3,375 (Java-Bali: 2,501, Jakarta: 659, Other regions: 215)</td>
<td>Knowledge, behaviors, concerns, vulnerability, sentiments, demographics</td>
</tr>
</tbody>
</table>

For more details on the cross-survey questionnaire comparison, please see this [online matrix](#).
Integration with other big data analytics efforts: mobility analysis using FB and Google data

Work supported by MTI / Governance and undertaken by data scientists in GFDRR

- **Google Community Reports** measure *change in visits* to residential, commercial and public places-of-interest at the level of provinces and special regions.

- **Facebook Disaster Maps**, at the level of 600m *bing tiles*, provides metrics for (i) the number of people staying in a single tile all day (ii) the percentage change in total tiles visited on a given day (iii) change in population in tiles, and (iv) change in movement between tiles.

- **Facebook Population Data** provides 8-hourly counts of users within kecamatan and can allow for measurements of migration movements.
FINDINGS
AWARENESS AND BEHAVIOR CHANGE
Knowledge: In populations surveyed awareness is high, use of social media for information is common

Citizens already have high awareness about COVID-19

- Have heard about COVID-19: 98%
- Have received info about social distancing & self-isolation: 97%
- Know the three main symptoms: 89%

Social media is used as prominent source of information

- >80% received info about social distancing on social media, 88% of them believe that it is reliable

<table>
<thead>
<tr>
<th>Source of Information</th>
<th>% of Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>FB/WA/Twitter/IG</td>
<td>83%</td>
</tr>
<tr>
<td>TV</td>
<td>80%</td>
</tr>
<tr>
<td>SMS/Phone</td>
<td>53%</td>
</tr>
<tr>
<td>Village/Hamlet/Town Head</td>
<td>50%</td>
</tr>
<tr>
<td>Poster/Flyer in Community</td>
<td>42%</td>
</tr>
<tr>
<td>Neighbours</td>
<td>40%</td>
</tr>
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Official website and SM are prominent source used to fact-check

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<td>WHO website</td>
<td>41%</td>
</tr>
<tr>
<td>Social media</td>
<td>22%</td>
</tr>
<tr>
<td>MoH website</td>
<td>18%</td>
</tr>
<tr>
<td>Health workers</td>
<td>11%</td>
</tr>
<tr>
<td>Friends/family</td>
<td>4%</td>
</tr>
</tbody>
</table>

Source: online survey; April 20th - May 20th, 2020; N=3,375 (Java-Bali: 2,501, Jakarta: 659, Other: 215)
Many popular SM posts focus on social distancing measures and staying at home

**On Twitter:** Most retweeted post comes from regular users, #stayathome is the most popular topic

- **Advises to stay at home**
  - Likes: 3.5K

- **Cartoons picture which encourage staying at home**
  - Likes: 2.8K

- **Cooking recipes for #Stayathome activities**
  - Likes: 1.7K

- **Room decoration advice for #Stayathome activities**
  - Likes: 3.5K

**On Instagram:** Most liked post usually comes from celebrities with topics related to the public figure’s life on quarantine or entertainment videos

- **Travel Parody video**
  - Likes: 85K

- **Online breakfasting video**
  - Likes: 96.2K

- **Travel Parody video**
  - Likes: 181K

- **Health workers parody video**
  - Likes: 182K

- **Home exercise video**
  - Likes: 180K

Source: Twitter and Instagram, 10-13 May 2020 (latest update). [Click here](#) to visit Most Liked Post on Twitter and [Click here](#) to visit Most Liked Post on Instagram

**World Bank Group**
However, challenges remain in following public health, social distancing, and self-isolation measures.

~60% indicated to have challenges in following prevention measures¹

<table>
<thead>
<tr>
<th></th>
<th>No challenges</th>
<th>Have challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>% respondents</td>
<td>41%</td>
<td>59%</td>
</tr>
</tbody>
</table>

For those with challenges, top challenges are typically due to daily work and buying food:

- Can’t avoid crowded spaces when buying food: 38%
- Can’t stay at home as I need to work outside: 34%
- Can’t avoid people in my daily work: 25%
- Important to socialize in my community: 18%
- Need to visit mosque/church: 8%

Only the top 5 options are shown.

Some of them said it has impacted their income and jobs:

- Needed to return to village / hometown since they have lost their jobs: 7%
- Mostly an issue for males 35-50 years old

All challenges are more severe for lower income group.

¹ Question: What challenges do you face following public health, social distancing and self isolation measures?
Source: online survey; April 20th - May 20th, 2020; N=3,375 (Java-Bali: 2,501, Jakarta: 659, Other: 215)
Our survey result is also confirmed with mobility insights from big data analytics

LSRR and travel ban policy have reduced the mobility of people in hotspot locations...

.. and cause most people to spend more time at home...

.. with fewer trips in and out of Jakarta

[Graph showing change in mobility vs. total sub-national GDP (Q1 2020)]

Despite that, there is still evidence of urban flight..

[Graph showing change in visits to residential vs. workplace locations in Indonesia]

[Bar chart showing 10/15 admin 2 units with the greatest decrease in population are Kota (cities)]
## Comparison of findings across surveys

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<tr>
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<th>JPAL</th>
<th>BPS</th>
<th>Warwick</th>
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<td>✓</td>
<td>N/A</td>
<td>High level of awareness on LSSR</td>
<td>N/A</td>
</tr>
<tr>
<td>Health behavior change (sanitation and hygiene)</td>
<td>High level of change in hygiene behavior</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Challenges with social distancing</td>
<td>Moderate (only 41% have no problem implementing)</td>
<td>Moderate (29% can’t practice social distancing at work, 20% can’t when using public transport)</td>
<td>Strong (only 21% made changes to improve social distancing)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Migration</td>
<td>Low</td>
<td>N/A</td>
<td>High – especially within same kabupaten/city</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Legend:** ✓ = similar result to our survey

See extra slides for more details
CONCERNS AND VULNERABILITIES
Spikes in Tweet volume respond to the recent policy or announcement enacted by the government

Source: Policy Issue Identification Word Embedding

Date: March 23th – May 24th
#Tweets: ~3.3 million

30 March: Jokowi orders large-scale social restrictions (LSSR) coupled with 'civil emergency' policies

23rd March: President inaugurated Wisma Atlet

2 April: Indonesia's Justice and Human Rights Ministry release more than 30,000 prisoners

7th April: LSSR in DKI Jakarta is approved

21st April: President announced decision to ban 'mudik'

8th May: Punishment fee for people who travel and/or mudik

18th May: Despite LSSR, market/mall are crowded for Eid preparation

2 April: Indonesia’s Justice and Human Rights Ministry release more than 30,000 prisoners

7th April: LSSR in DKI Jakarta is approved

21st April: President announced decision to ban 'mudik'
Almost all provinces in Indonesia discussed COVID-19 in SM. But there was more discussion in areas with high case loads.

**Insights:**
- COVID19 is mostly discussed in Java-Bali region where 66% cases COVID19 are located.
- Low volume of conversation on COVID19 in Eastern part of Indonesia.

Source: 1. Author's calculation from Mins. Health Website per 30 May 2020
Government handling of situation, food access and health care are salient topics discussed in both Twitter and Instagram.

**Distribution of topic discussed on Twitter**

**Distribution of topic discussed on Instagram**

Click Here to See the Interactive Visualization

Data collected from March 23th – May 24th

#Tweets: ~ 3.3 million

#Posts: ~ 5.7 million

Note: There is strong degree of overlap of topics discussed – see annex slides.

Source: Policy Issue Identification Word Embedding
News media resonates with SM:
Food access, confidence in government and health care are salient topics

Distribution of topic discussed on GDELT News Data

- Food access: ~220k
- Confidence in government: ~220k
- Health care: ~220k
- Job loss: ~170k
- Travel restrictions: ~140k
- Mask for all: ~100k
- Social distancing: ~80k
- Stigma: ~50k

Data collected from March 23th – May 17th
#News: ~ 220k

Note: There is strong degree of overlap of topics discussed – see annex slides.
Discussions have shifted over time in both Twitter and Instagram.

Attention to job loss was significant in mid-May; food access and health care are more current concerns.

Concerns on food access remains high throughout April; discussion on government rose in early May.

Date: March 23th – May 24th
#Tweets: ~3.3 million

Click Here to See the Interactive Visualization

Source: Policy Issue Identification Word Embedding

Click Here to See the Interactive Visualization

Date: March 23th – May 24th
#Posts: ~5.7 million
Shifts in discussion also happened in news media:
Confidence in government receives much attention on earlier (late March until mid-April); discussion on economic impacts of COVID-19 peaked recently (job loss peaked on late April and food access peaked on mid-May); health care was a prominent concern in early May

Source: Policy Issue Identification Word Embedding

Data collected from March 23th – May 17th
#News: ~ 220k
Concerns raised on SM also found in online survey:
In general everyone is most worried about **getting sick**, then **having enough to eat** and **losing job** are important concerns.

Concerns are more acute among low income groups
When asked about healthcare access 77% indicated they could access the care they needed.

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<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Group</td>
<td>18-34</td>
</tr>
<tr>
<td></td>
<td>35-50</td>
</tr>
<tr>
<td></td>
<td>50+</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
</tr>
<tr>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>Income Group</td>
<td>less than IDR 2 million</td>
</tr>
<tr>
<td></td>
<td>IDR 2-5 million</td>
</tr>
<tr>
<td></td>
<td>IDR 5-10 million</td>
</tr>
<tr>
<td></td>
<td>IDR 10-20 million</td>
</tr>
<tr>
<td></td>
<td>more than IDR 20 million</td>
</tr>
<tr>
<td>Total</td>
<td>Indonesia</td>
</tr>
</tbody>
</table>

Source: Online Survey. Based on data collected between April 20th - May 20th, 2020; N=3,375 (Java-Bali: 2,501, Jakarta: 659, Other regions: 215)
Health and Economic Concerns are confirmed by other surveys..

Result of health concern in our survey..

- 38% Respondents indicated getting sick as their primary concern\(^1\)
- 78% are concerned about the spread of COVID-19 in their community
- 85% are concerned about access to adequate healthcare

Job loss is prominent economic concern in our survey..

- 54% Respondents are working less – fewer days and hours\(^3\)
- 66% are not working
- 44% are working

56% of men and 58% of women were working before, but are no longer working

Note: 1. Question: What is your biggest concern in the next week? 2. % of respondents answering 'concern' and 'very concern' 3. Question: Do you work less hours, fewer days? Source: World Bank Online Survey, Premise Indonesia Dashboard, Online Survey on Economic Impact of COVID-19 in Indonesia Results by JPAL from Week 6
as are food security and food price concerns

14% of our respondents are prone to food insecurity…¹

- Eating Less: 14%
- Eating normally: 86%

indicated that it’s due to price surge

- 35% have needed help from friends and family
- 10% have borrowed money

…which aligns with JPAL and PREMISE study

Food insecurity has higher magnitude in JPAL study

- 35% of households report having to eat less than they should often
- 23% households ate as usual in the last week
- 44% people are affected by sudden price surge²

Note: 1. Question: Did you or any household member eat less, substitute foods, skip meals, or not eat, even when hungry?? 2. % of respondents answering having ‘moderate effect’ and ‘major effect’. Source: World Bank Online Survey, Premise Indonesia Dashboard, Online Survey on Economic Impact of COVID-19 in Indonesia Results by JPAL from Week 6
SENTIMENT ANALYSIS
The average tone of news media has been negative but is moderating
However, many survey respondents indicated they were \textit{moderately to significantly worried} about the situation, with \textit{73\% concerned about unrest}.

People aged 35-50 and women are more worried regarding the current situation.

73\% of respondents are concerned about social unrest.

Source: Online Survey. Based on data collected between April 20th - May 20th, 2020; N=3,375 (Java-Bali: 2,501, Jakarta: 659, Other regions: 215)
Sentiment to government: People show more confidence in provincial than central government

Do you think the reaction by the central government to the current coronavirus outbreak is appropriate, too extreme or not sufficient?

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Indonesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not sufficient</td>
<td>2%</td>
<td>30%</td>
</tr>
<tr>
<td>Appropriate</td>
<td>68%</td>
<td></td>
</tr>
</tbody>
</table>

Do you think the reaction by the provincial government to the current coronavirus outbreak is appropriate, too extreme or not sufficient?

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Indonesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not sufficient</td>
<td>3%</td>
<td>40%</td>
</tr>
<tr>
<td>Appropriate</td>
<td>57%</td>
<td></td>
</tr>
</tbody>
</table>

Who do you count on most to support you through this period?

Source: Online Survey. Based on data collected between April 20th - May 20th, 2020; N=3,375 (Java-Bali: 2,501, Jakarta: 659, Other regions: 215)
Twitter Topic Keyword Sentiment: Confidence in Government

Twitter users seem to have more favorable sentiment toward local government compared to national government.

Date: March 23th – May 24th
#Tweets: ~3.3 million
National police remains the most widely-discussed topic on Twitter as they are the main actor to ensure that LSSR is implemented.

Date: March 23th – May 24th
#Tweets: ~3.3 million
Comparison of discussion on government across platforms

- Police, national government, and regional government consistently becoming main topic across all platforms
- In mainstream news media, Jakarta and Surabaya are the two prominent cities covered due to the number of cases

Source: Policy Issue Identification Word Embedding
Comparison of results in sentiments:
Our results more moderate than Warwick survey but stronger than with PREMISE survey

<table>
<thead>
<tr>
<th>Public and Government Response Perception (in percentage)</th>
<th>WB Survey</th>
<th>Warwick Indonesia(^1)</th>
<th>Warwick Global(^1)</th>
<th>PREMISE(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government response is too extreme</td>
<td>Central Government: 2</td>
<td>0.4</td>
<td>8.3</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Local Government: 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government response is insufficient</td>
<td>Central Government: 68</td>
<td>83.8</td>
<td>49.2</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Local Government: 57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government response is enough</td>
<td>Central Government: 30</td>
<td>15.8</td>
<td>42.5</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Local Government: 40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N for Indonesia = 1,618 respondents, N for World = 113,083. Dataset analyzed is May 1, 2020 version and PREMISE Indonesia Dashboard

- **Warwick survey confirms our result that most Indonesians thinks that** government’s response is insufficient.
- However, in PREMISE, up to **65%** respondents believe that government’s response is sufficient.
- Based on PREMISE survey, **48%** trust their national government more (only **28%** trust their local government more).

Note: 1. Government=General country’s government (both local and central government) 2. Government=Local (Town or municipality) government
Most respondents believe that it will take >2 months for things to get back to normal

Female and people with higher income group tend to believe that it will take longer for the country to recover

Source: Online Survey. Based on data collected between April 20th - May 20th, 2020; N=3,375 (Java-Bali: 2,501, Jakarta: 659, Other regions: 215)
NEXT STEPS
Future activities

• Continued monitoring of social media and online news

• New rounds of online survey data:
  • In which sectors are job losses occurring?
  • Which food prices are increasing?
  • Awareness and support of government response programs
  • Knowledge of COVID-19 cases
  • Target questions to SM users based on content they are sharing

• Google trends analysis: what does this show us about evolving concerns?

• Credibility and independence of news coverage

• Misinformation assessment
Looking ahead: Policy Implications

- Likely reduction in policy stringency, especially Java/Jakarta
- Early warnings for localized "second wave"
- Shift from response to recovery more nuanced set of issues
- Important to keep tracking numbers
Extra Slides
Social media use is prevalent in Indonesia – over 90% penetration of SM

Accessed Any Social Media Platform

Gender
- Male
- Female

Education
- Primary education or below
- Lower secondary education
- Upper secondary education
- Tertiary education

Age Group
- 15-19
- 20-24
- 25-29
- 30-34
- 35-39
- 40-44
- 45-49
- 50-54
- 55-59
- 60-64
- 65+

World Bank DEHS n = 3126
...and intensive – over half of respondents spend more than 2 hours per day on SM
Who we monitor: Twitter Users Demographic Across Region

*12% of twitter users self-report location information

Date: March 23th – May 24th
As per May 20th 2020, we managed to have 3,375 respondents with varied characteristics.

**Source:** Online Survey. Based on data collected between April 20th - May 20th, 2020; N=3,375 (Java-Bali: 2,501, Jakarta: 659, Other regions: 215)
Attention to government activities may reflect the nature of conversations on Twitter

Topics discussed on Twitter

- Politics: 33%
- Religious matters: 16%
- Gossip: 5%
- Academic/public policy issues: 34%
- Hobby/lifestyle: 49%
- Work/business: 2%

World Bank DEHS n = 3126
In late March wet markets were a major topic as they changed opening hours; "belanja recently becomes trending because people need to buy necessities for Eid preparation.

Date: March 23rd – May 24th
#Tweets: ~3.3 million
‘Mudik’ has been a trending topic as many people are still discussing whether to go home despite the government’s travel advisories.

Date: March 23th – May 24th
#Tweets: ~3.3 million
These concerns are also reflected through mainstream news media and unsupervised Twitter topic analysis.

In 6 out of 8 topics, #dirumahaja is a top keyword showing social distancing is one of the most discussed topic in Social Media.

The news cover more topics and focus on highlighting the government response in COVID-19 prevention (LSSR, social assistance, rapid test) and also COVID-19 general news and update. GDELT data covers over 200,000 published articles on COVID-19 in Indonesia since 3/29/2020; 98 different news sources covered.
## Summary: Comparison of findings across surveys

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<td>Migration</td>
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<td>N/A</td>
<td>High – especially within same kabupaten/city</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Food insecurity</td>
<td>Low (14%)</td>
<td>N/A</td>
<td>Moderate (35%)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Employment</td>
<td>High impact (54% working less)</td>
<td>N/A</td>
<td>High impact (57% used to work now not working)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Greatest concerns</td>
<td>Getting sick, losing job, having enough to eat</td>
<td>Getting infected and economic impacts</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Intensity of concerns</td>
<td>Moderate (3.5 out of 5)</td>
<td>High on short-term outlook</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Sentiment towards government</td>
<td>Moderate dissatisfaction</td>
<td>Moderate satisfaction</td>
<td>N/A</td>
<td>N/A</td>
<td>Strong dissatisfaction (but earlier data)</td>
</tr>
</tbody>
</table>

See extra slides for more details
ANNEXES
Many Twitter users who discuss about government also interested in travel restrictions.

Source: Policy Issue Identification Word Embedding
Many Instagram users who discuss about food access also interested in health care, social distancing and travel restrictions.

Source: Policy Issue Identification Word Embedding
Topic Overlaps on GDELT News

Topic Overlaps, Fraction (by Column) of GDELT News

Source: Policy Issue Identification Word Embedding
Weighting Method for SM COVID-19 Survey (1/2)

- This weighting framework uses 18+ years old individual with access to social media in 2019 in Indonesia as the reference population. According to the Susenas 2019, the number of this reference population is approximately 82 million individuals.

- After choosing our reference population, we look at the distribution of reference population across multiple “boxes”. “Boxes” here refer to the finite combination of groups formed by a category of region, b category of age group, c category of gender, and d category of income group (to proxy for income in Susenas, we will use the expenditure data instead). For each of the box, we define x as the total number of population in a single, unique combination of a, b, c, and d.

- After obtaining the value of x for each box, we distribute x uniformly within the box by dividing x with the total number of observation that available in each of the box. We define the result of the division between x and total number of surveyed observation (n) on each box as y. This can be written as:

(please continue to the next page)
Weighting Method for SM COVID-19 Survey (2/2)

\[ y_{a,b,c,d,i} = \frac{x_{a,b,c,d}}{n_{a,b,c,d}} \]

, where:

- \( y_{a,b,c,d,i} \) = weight of observation \( i \) of region \( a \), age group \( b \), gender \( c \), and income group \( d \).
- \( x_{a,b,c,d} \) = total population of region \( a \), age group \( b \), gender \( c \), and income group \( d \) (derived from Susenas).
- \( n_{a,b,c,d} \) = total surveyed observation of region \( a \), age group \( b \), gender \( c \), and income group \( d \).

In the end, we assign \( y \) as the weight for each \( i \) observation in the SM COVID-19 Survey data.
Number of FB Survey’s sample per day

- The number of survey samples ranges from 0 to 1000.
- A significant increase is observed on 5/11/2020, reaching nearly 900 samples.

This graph indicates a peak in survey participation on 5/11/2020.
Misinformation Prediction Methodology

- TL;DR: extract keywords from misinformation manually -> expand keywords using word embedding (only for verbs) -> keyword matching between misinformation news corpus and tweets corpus. Misinformation news is clustered manually.