**Population-Scale Study of Human Needs During the COVID-19 Pandemic: Analysis and Implications**

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**Motivation**
Existing studies and datasets of the COVID-19 pandemic focus on biomedical and epidemiological aspects of the case and fatality rates. However, the pandemic also presents societal, economic, and psychosocial challenges. Therefore, we need to understand the impact of the pandemic on the system of human needs to inform pandemic preparedness and responses.

**Summary**
We present a computational framework for quantifying effects of the pandemic on human needs expressed through web search interactions. Basic needs were elevated while growth needs were subdued. Earlier and longer shelter-in-place mandates may have unintended consequences on social-emotional needs. We expose gaps between reported and expressed needs.

**Human needs framework**

**Search interactions**
Human needs are expressed and fulfilled through seeking information or obtaining tangible support or material items.

**Categorization**
We define five broad categories of needs that can be extracted from web searches, inspired by Maslow’s hierarchy of needs: Physiological (Self-sustenance-related queries), Safety (protective measures), Love and belonging (social-emotional needs), Cognitive (searching for information), and Self-actualization (propositional logic).

**Detection**
Each search interaction is tagged with one or more need categories using regular expressions and basic propositional logic.

**Quantification**
We use difference-in-differences method to quantify the relative changes in needs expression, while accounting for weekly, seasonal, and query volume variations.

**Findings**

1. **How did human needs change over time?**
   - Physiological needs are the first rise with health condition interests and COVID-related purchase intents.
   - Online education interests start to dominate around the start of shelter-in-place mandates.
   - Hobbies and online social activities gradually increase.
   - Stimulus and unemployment queries dominate.
   - Second rise of health and economic concerns appear as COVID cases rise.

2. **Which needs increased or decreased the most?**
   - Basic needs are heightened, while growth needs are subdued.
   - Unemployment, food assistance, and online social activity needs have not returned to pre-pandemic baseline indicating prolonged economic instability and social isolation.
   - Growth needs indicative of positive outlook remain below pre-pandemic baseline.

3. **How do shelter-in-place (SIP) policies impact social-emotional and relationship needs?**
   - Earlier SIP start dates are correlated with more mental health site visits and fewer online social activities queries.
   - Longer SIP durations are correlated with more negative mental health experiences and fewer wedding site visits or purchases.

4. **Are web needs expressed more than reports?**
   - Similar patterns between web and USCSI data can be seen, but discrepancies could indicate additional search needs for unemployment-related information.
   - Initial increase in domestic violence needs mask reports from national hotlines. Given increased risk of domestic violence during the pandemic and increased femal purchase intents, additional investigation is necessary to understand potential barriers to online resources.

**Implications**

**Resilience and vulnerability**
Changes in needs can be an indication for a level of psychological and economic resilience and vulnerability. We need to understand how a community can endure social and economic distress and which communities are disproportionately and negatively impacted.

**Preparedness and resources**
Changes in needs can guide efforts in preparing responses to future events and providing critical resources. Understanding the impact of offering policies or identifying potential barriers to expressing or fulfilling the needs can help prepare adequate support and increase access to critical resources and interventions.

**For full appendix, check out**

**Thank you**
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