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DSCD 611 – Programming for Data Scientists I

Global Analysis of Acute Food Insecurity Using IPC Phase Classification

Group Name: *[B11]*

Group Members

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1 Introduction and Topic Overview

Acute food insecurity remains one of the most pressing global humanitarian challenges, affecting hundreds of millions of people worldwide. The Integrated Food Security Phase Classification (IPC) framework provides a standardized and internationally recognized methodology for assessing the severity and scale of food insecurity across countries and over time. By categorizing populations into five phases ranging from Minimal food insecurity (Phase 1) to Catastrophe/Famine (Phase 5), the IPC enables evidence-based decision-making for humanitarian response and policy planning.

This project presents a global, data-driven analysis of acute food insecurity using IPC data, with a particular focus on populations classified in Crisis or worse (IPC Phase 3+). The study examines global trends, country-level severity and burden, regional disparities, crisis depth, volatility, deterioration, and recovery patterns.

2 What Is Known About the Topic

Existing research identifies conflict, economic instability, climate shocks, and governance challenges as key drivers of acute food insecurity. Prior studies often focus on single-country analyses or snapshot assessments of food insecurity severity. While these approaches provide valuable insights, they may fail to capture broader global patterns and temporal dynamics.

The IPC framework is widely used by governments, international organizations, and humanitarian agencies to guide emergency responses and long-term planning. Increasingly, researchers emphasize the importance of understanding not only the severity of food insecurity but also its volatility, persistence, and recovery trajectories.

3 Why the Topic Is Important

Global food insecurity has intensified in recent years due to overlapping global shocks, including climate extremes, armed conflict, and economic disruptions. Policymakers and humanitarian organizations face limited resources and must prioritize interventions effectively.

This project contributes to this effort by identifying countries and regions with the highest severity, greatest burden, fastest deterioration, and strongest recovery signals. Such insights are critical for early warning systems, targeted humanitarian action, and the design of sustainable, long-term food security strategies.

4 Data Description

The analysis uses the `IPC_IPC_PHASE.csv` dataset obtained from the Integrated Food Security Phase Classification initiative. The dataset contains monthly observations for multiple countries, reporting both population counts (`PS`) and population percentages (`PT`) across IPC Phases 1 through 5.

Key variables include country identifiers, time periods, IPC phase categories, and associated population metrics. The longitudinal nature of the dataset enables detailed analysis of trends, volatility, and recovery patterns over time.

5 Methodology

The project was implemented using Python, leveraging several data science libraries. Data manipulation and cleaning were performed using `pandas`, while `matplotlib` and `seaborn` were used for visualization. Statistical analysis employed `scipy`, and trend estimation was conducted using linear regression from `scikit-learn`.

Data preprocessing involved cleaning missing values, extracting IPC phase numbers, converting time variables into datetime format, and reshaping the dataset into wide format. Several derived indicators were computed, including:

- Percentage of the population in IPC Phase 3 or worse
- Country share of the global Phase 3+ population
- Crisis depth measured as the Phase 4–5 share of Phase 3+
- Volatility measured using standard deviation
- Trend slopes indicating deterioration or recovery

Both descriptive and inferential methods were applied, including time-series visualization, bar charts, correlation analysis, and two-sample t-tests for regional comparisons.

6 Results and Societal Impact

The analysis shows that global food insecurity is highly volatile, with sharp spikes reflecting periods of global stress. A small number of countries account for a disproportionately large share of the global Phase 3+ population, highlighting the concentration of humanitarian need.

Regional analysis indicates that East Africa consistently experiences higher and more volatile food insecurity than West Africa, with the difference being statistically significant. Several countries also exhibit extremely deep crises, where large proportions of food-insecure populations fall into Emergency or Famine phases.

Dynamic analysis further reveals both rapidly deteriorating contexts and countries showing signs of recovery. These findings underscore the importance of early warning systems, targeted interventions, and context-specific policy responses.

7 Team Contributions

This project was completed as a collaborative group effort with clearly defined roles:

- **Richard Gidi (Group Leader):** Drafted the project proposal, handled data acquisition, designed and implemented the ETL pipeline, and performed data cleaning. He produced analysis-ready datasets and coordinated the analytical workflow.
- **Ebenezer Botwi:** Led the data analysis and feature engineering, including the creation of derived indicators and support for exploratory and statistical analysis.
- **Theresa Sackey:** Interpretation of Key Findings.Her role ensured that the results were clearly explained, logically consistent, and aligned with the study's research questions and objectives.

- **Adams Diiwu Amadu:** Oversaw project synthesis, managed timelines, and designed the final presentation slides for effective communication of results.

8 Reflections

This project reinforced the importance of reproducible workflows, clear documentation, and collaborative coordination in data science projects. Working with a complex global dataset highlighted the challenges of balancing analytical depth with clarity and interpretability.

The group-based approach demonstrated the value of role specialization, effective communication, and shared responsibility. Future extensions of this work could integrate causal modeling, climate indicators, or predictive early warning systems.

9 Conclusion

By leveraging IPC data and combining multiple analytical perspectives, this project provides a comprehensive assessment of global acute food insecurity. The findings emphasize the need for targeted, dynamic, and region-specific interventions to address one of the most critical humanitarian challenges facing the global community.

References

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