MINISTRY OF
ELECTRONICS &
INFORMATION TECHNOLOGY
GOVERNMENT OF INDIA

Digital India
Power To Empower

MeitY – IT Iniatives

August 13, 2024

Introduction

- Under the leadership of our Honorable Prime Minister, India is on a path to becoming “VIKSIT BHARAT” by 2047.
- Central to this vision is leveraging technology and data to drive informed decision-making and inclusive growth.
- Data holds immense potential to transform governance, public service delivery, and citizen engagement.
- In today’s digital age, data is the new oil—critical for informed decision-making and policy formulation.

Importance of Data-Driven Decision Making

- **Role of Data in Governance:** Data is a fundamental building block in the context of digital governance. Quality of the data, in collection, management, and processing methods and practices, can greatly influence the efficacy of data-based innovations like Digital Public Infrastructure and Artificial Intelligence.
  - The Open Government Data (OGD) initiative:
    - As of August 2024, hosts over 502,000 data resources.
    - Engaged 571 Chief Data Officers from various government entities.
    - Data resources accessed over 10.30 million times.

- **Strengthening State Statistical Systems:**
  - Robust statistical systems at the state level is crucial to ensure accurate, timely, and relevant data collection.
  - Upcoming Gov.In Bharat Data Exchange (Gov.In BharatX) platform will facilitate seamless data sharing between various stakeholders.

Leveraging AI and Data for Policy Making

- AI is a game-changer, offering insights beyond human capabilities.
- **IndiaAI Mission**: A national program with an outlay of INR 10,371.92 crores.
- **Key Pillars**: IndiaAI Compute Capacity, Innovation Centre, Datasets Platform, FutureSkills, Startup Financing, Safe & Trusted AI.
- **IndiaAI Datasets Platform**: INR 199.55 Cr platform for seamless access to non-personal datasets, with Real-time data sharing, AI model hosting, developer sandboxes, for Startups and Researchers
- **AI Curation Units**: Dedicated units will be set up in government ministries to improve data management practices with support from MeitY, under the IndiaAI Mission.
- Government is working towards AI regulation for safe and responsible AI along with opportunities for innovation and growth.

Digital India Bhashini

Digital India Bhashini aims to reduce language barrier and enhance accessibility of services and information by developing machine translation systems for Indian languages, by creating a Unified Language Interface (ULI).

- Free to use language (Text, Image and Speech) data and AI models in 22 Indian languages to provide translation and voice-based services
- Developed 300+ AI Models for speech & text translation and language Datasets through R&D Projects
- Enhances digital inclusion and accessibility, supporting Sustainable Development Goal to Reduce inequality.
- Bhasha Daan Crowdsources linguistic data from citizens to enrich Indian languages digitally.
- 7000+ contributions received from SUNO India and Bolo India, 3000+ from Likho India and Dekho India.
- **PM-KISAN AI Chatbot is** integrated with Bhashini for multilingual support. Provides precise answers in users' languages via text and audio formats.

Digital Public Infrastructure and e-Governance

Digital India Initiatives:

- Digital India has transformed society, making government services more accessible and efficient.
- The e-Office project promotes paperless governance with over 1.5 crore e-files generated.

•Public Services Delivery through Digital Platforms:

- DigiLocker platform allows citizens to store, access, and share digital copies of their important documents securely. 981 issuers have been onboarded on DigiLocker , with 30.78 crore users
- UMANG platform offers citizens a single point of access to a wide array of services, from central and state government departments. 2,039 services have been onboarded on UMANG platform, with 6.71 crore users
- MyScheme provide citizens with personalized access to government schemes and services. More than 2,470 schemes are available on Myscheme platform.

Capacity Building and Skill Development

- MeitY and its organizations has initiated various capacity building programs in emerging technologies
- Capacity building ensures readiness for data-driven governance and AI.
- Future Skills Prime initiative empowers professionals and students in advanced technologies like AI, ML, Blockchain, and IoT.
- We need to foster a culture of lifelong learning to maintain a competitive workforce ready for future challenges.
- NIELIT deemed to be University will further facilitate development of manpower in emerging technologies.

Cybersecurity – A Pillar of Digital Governance

- With integration of digital tools/data systems within our statistical systems, the importance of protecting the integrity and confidentiality of the data we collect cannot be overstated.
- Security of data and infrastructure is paramount in digital governance.
- National Cyber Security Policy (2013) addresses cybersecurity needs across sectors.
- Indian Computer Emergency Response Team (CERT-In) plays a vital role in cybersecurity efforts.
- Proactive measures and awareness campaigns by Government bolster cybersecurity.

Digital Personal Data Protection Act, 2023 (DPDPA)

- India has taken a significant step forward by passing its landmark Digital Personal Data Protection Act, 2023 (DPDPA).
- Framework grounded in key privacy principles of lawfulness, fairness, transparency, accountability, purpose and storage limitation, and security.
- Additionally, the DPDPA exempts its applicability when data processing is necessary for statistical purposes, as long as the data is not used to make specific decisions affecting a data principal.
- Aims to balance the rights of individuals to protect their personal data with data fiduciaries' right to process data on lawful grounds.

Importance of Data Protection

- Volume of data being generated, collected, and analyzed is unprecedented. The personal information gathered—whether it be through surveys, censuses, or digital platforms—carries with it the trust of millions of citizens.
- This trust is the cornerstone of a successful statistical system. It can only be maintained if we ensure that the data is handled with the safety and security.
- As digital tools become integral to our statistical processes, the risks associated with data breaches, unauthorized access, and misuse of information also increase.
- Robust data protection measures must be embedded into every aspect of our digital infrastructure. Not merely a technical issue, but a matter of ethical governance.
- We must protect the rights of individuals while ensuring that the data we collect is used solely for the purposes intended—to inform policy, improve services, and drive development.

Maintaining Public Trust

- At the heart of all our efforts in data protection is the need to maintain and enhance public trust. Any breach of this trust can have far-reaching consequences, not just for the individuals affected but for the credibility of our entire statistical system.

- Protecting data and its integrity is not just a technical challenge—it is a cornerstone of effective governance. We must integrate strong security measures into our statistical processes.

- By prioritizing data protection, we can build a statistical system that is both innovative and trustworthy, driving India's progress in the digital age.

Future Outlook

- **Leverage Data and Technology for Growth and Governance:**
  All stakeholders should focus on data and technology as powerful tools for growth, improved governance, and policy-making across all sectors.
- **Data-Driven Decision-Making:**
  Data-driven decision-making is essential for our vision of a developed India, leading to informed policies and impactful outcomes.
- **Capacity Building:**
  Invest in building capacities at all levels to ensure effective implementation of digital initiatives and foster sustainable development.
- **Data Security:**
  Ensure robust data security measures to protect sensitive information and build public trust in digital systems.


Digital India
Power To Empower
Thank You

Household Consumption Expenditure Survey
&
Data Quality

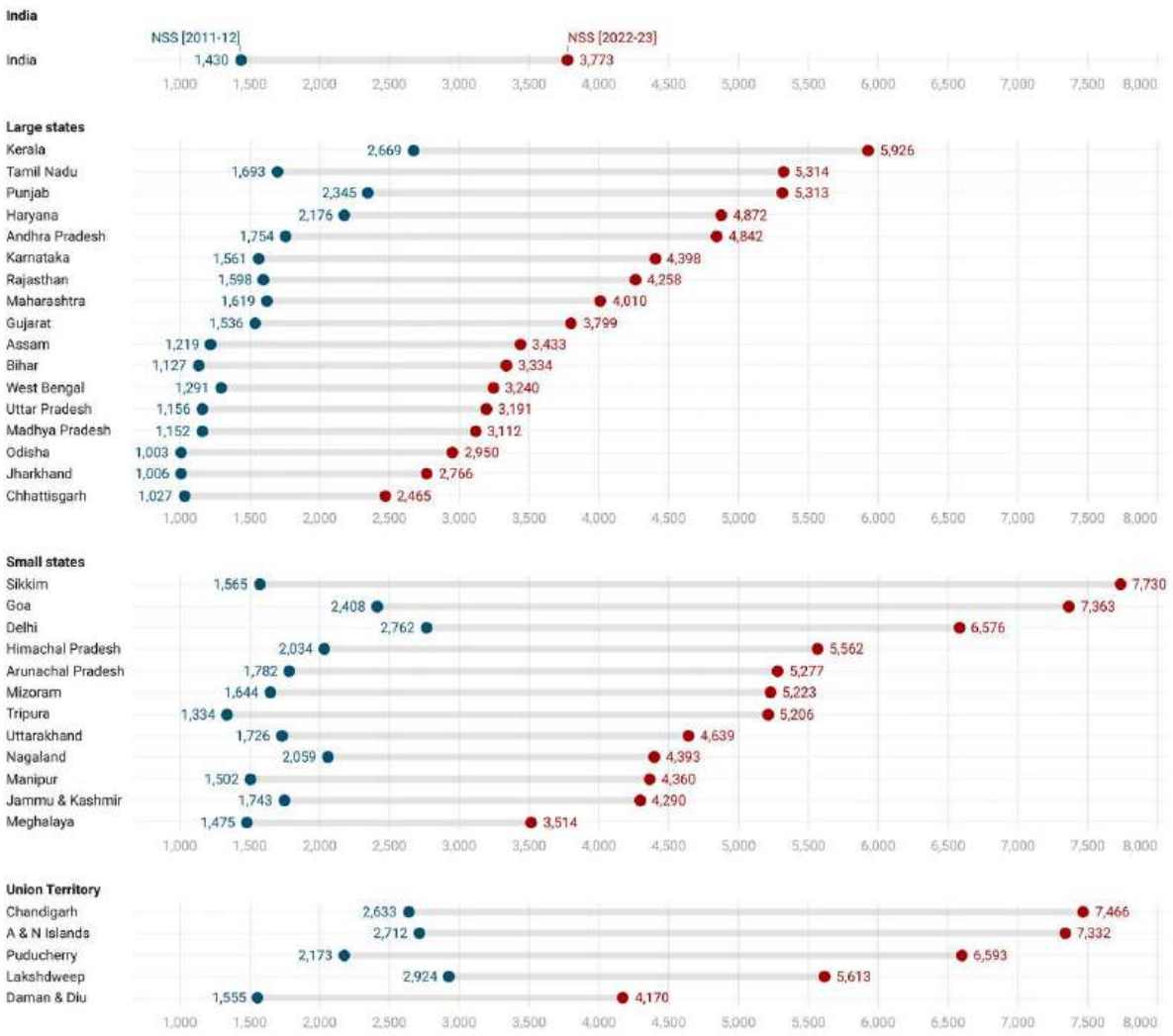
Dr. Shamika Ravi (Member, EAC–PM)

&

Dr. Mudit Kapoor (ISI, Delhi)

Key changes in the MPCE, NSS [2011-12] to NSS [2022-23]

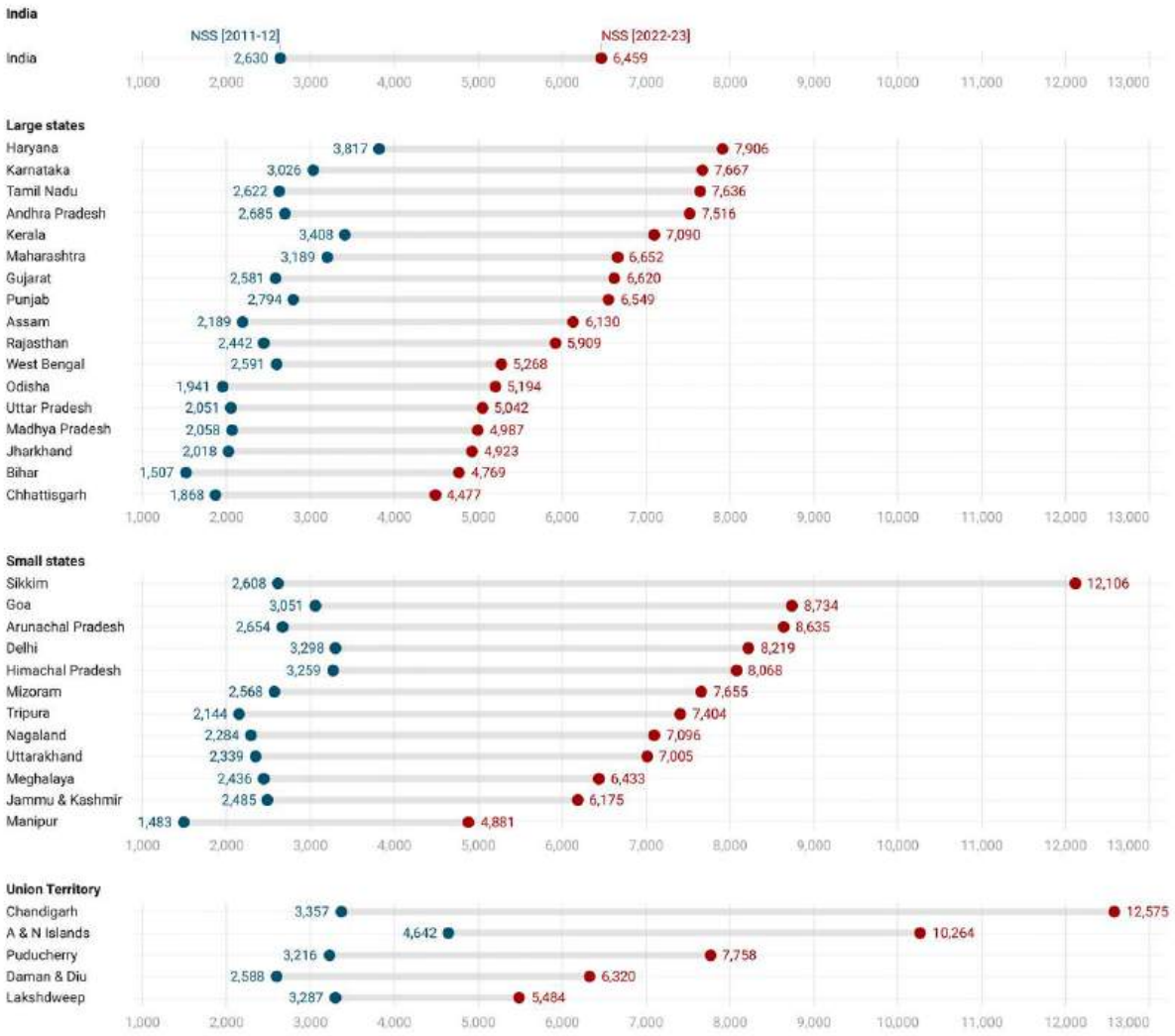
Average Monthly Per Capita Expenditure: Rural



The estimates are produced using the conventional frequentist-based approach.

Chart: Dr. Mudit Kapoor (EPU, ISI-Delhi Center) • Source: Ministry of Statistics and Programme Implementation • Created with Datawrapper

Average Monthly Per Capita Expenditure: Urban

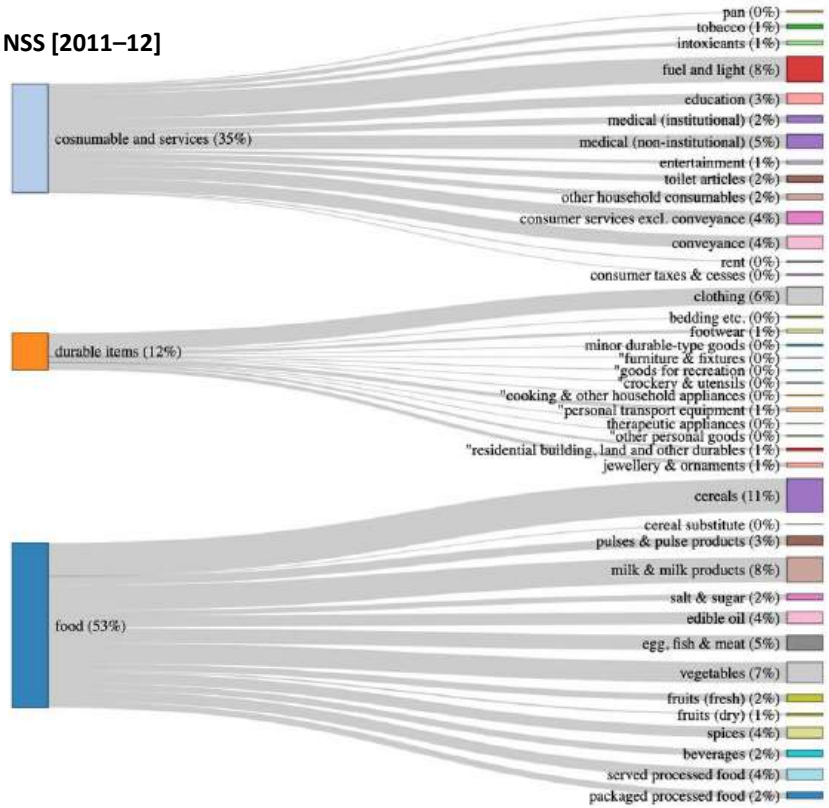


The estimates are produced using the conventional frequentist-based approach.

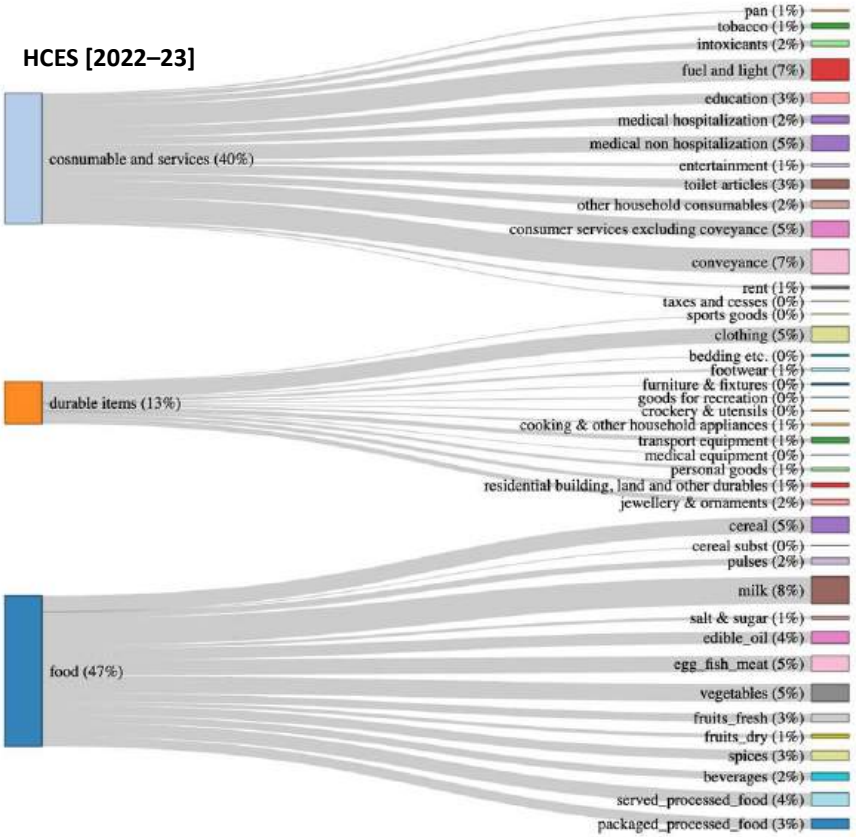
Chart: Dr. Mudit Kapoor (EPU, ISI-Delhi Center) • Source: Ministry of Statistics and Programme Implementation • Created with Datawrapper

Rural: Overall

NSS [2011–12]

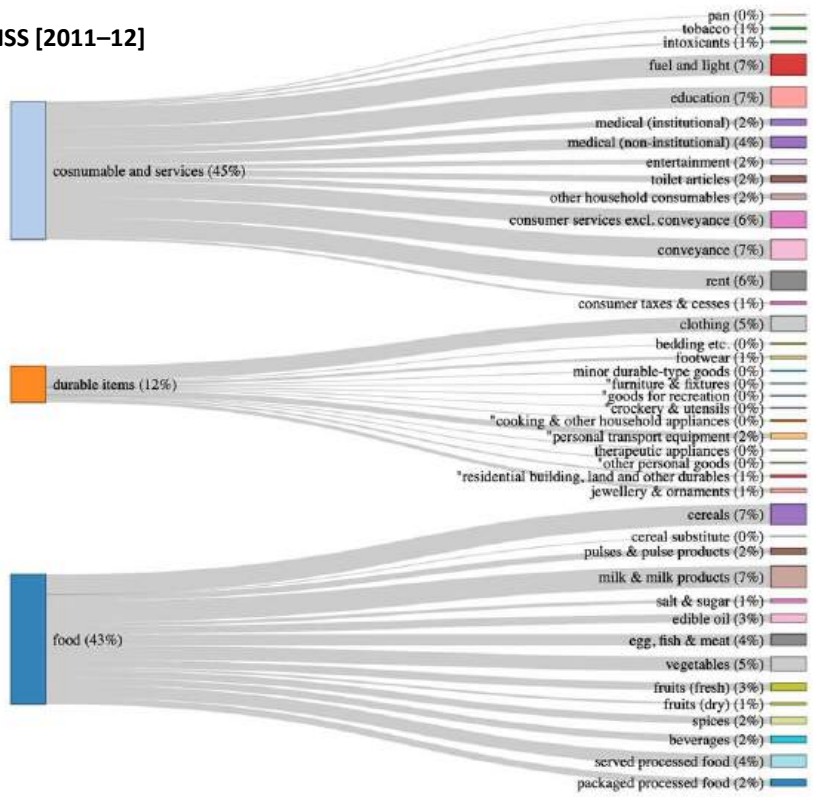


HCES [2022–23]

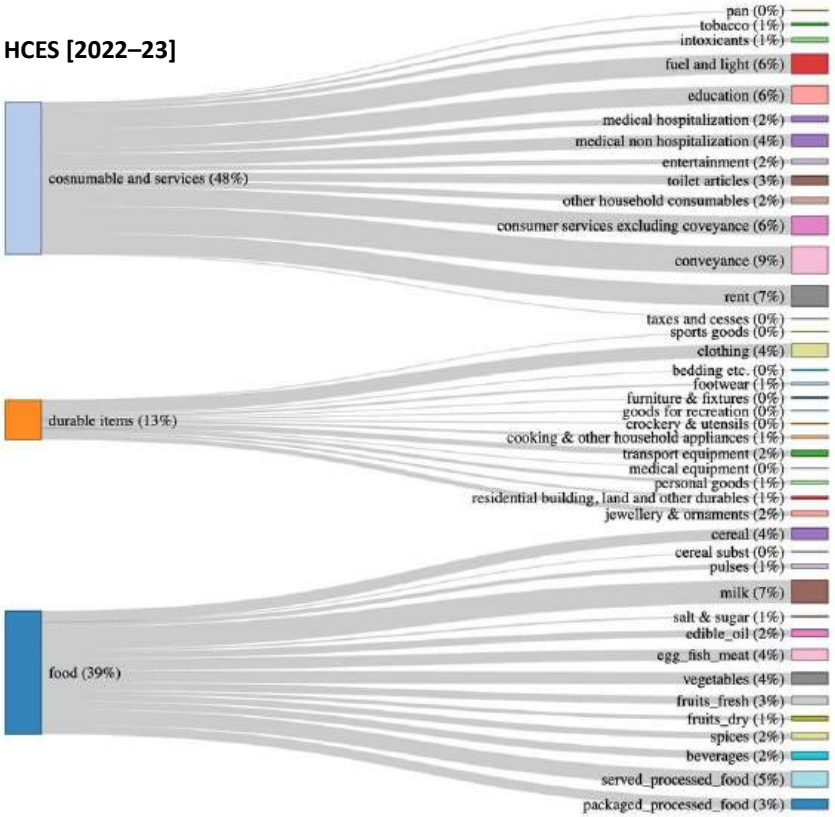


Urban: Overall

NSS [2011–12]

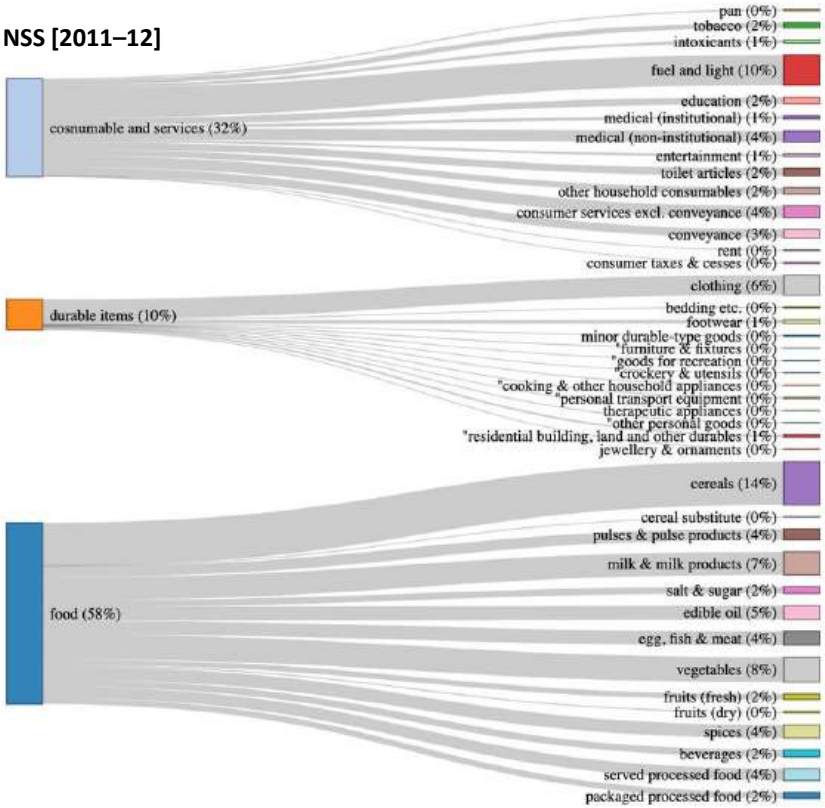


HCES [2022–23]

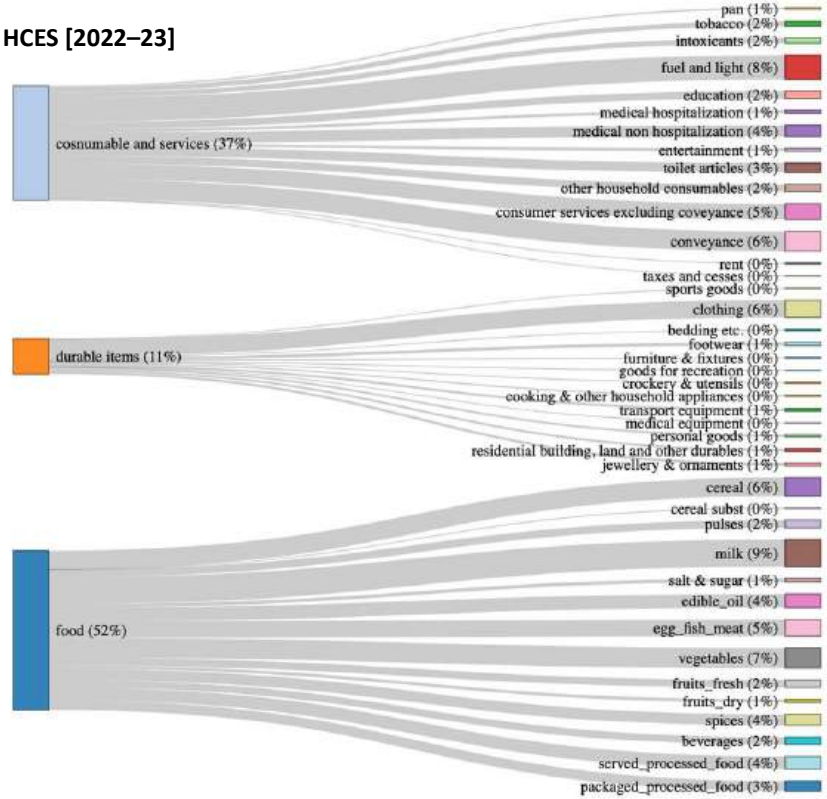


Rural: Bottom 50%

NSS [2011–12]

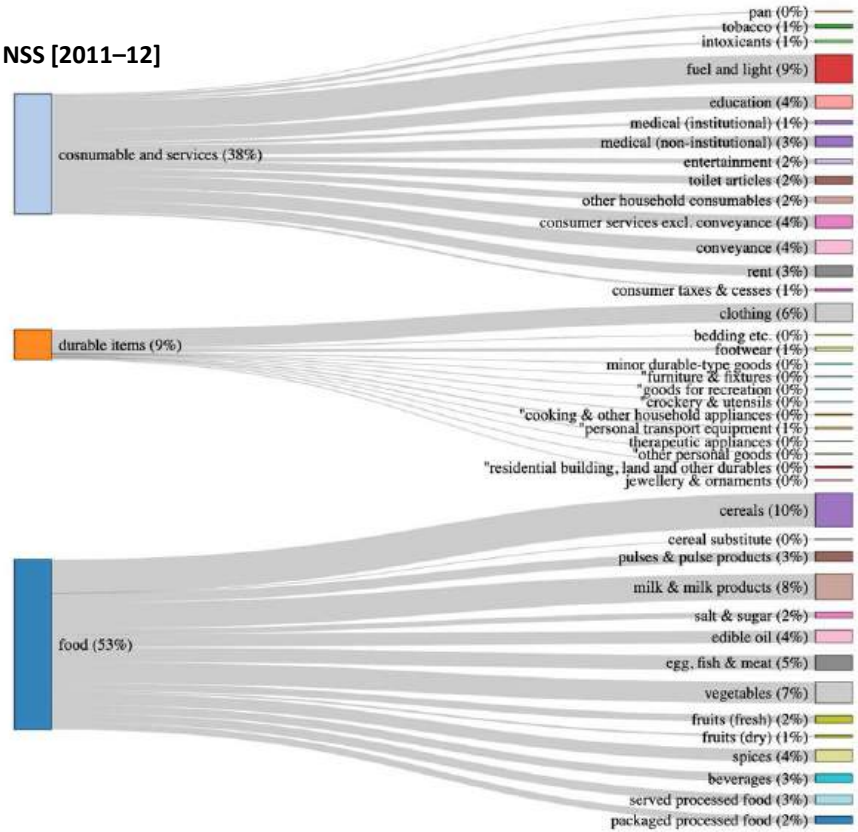


HCES [2022–23]

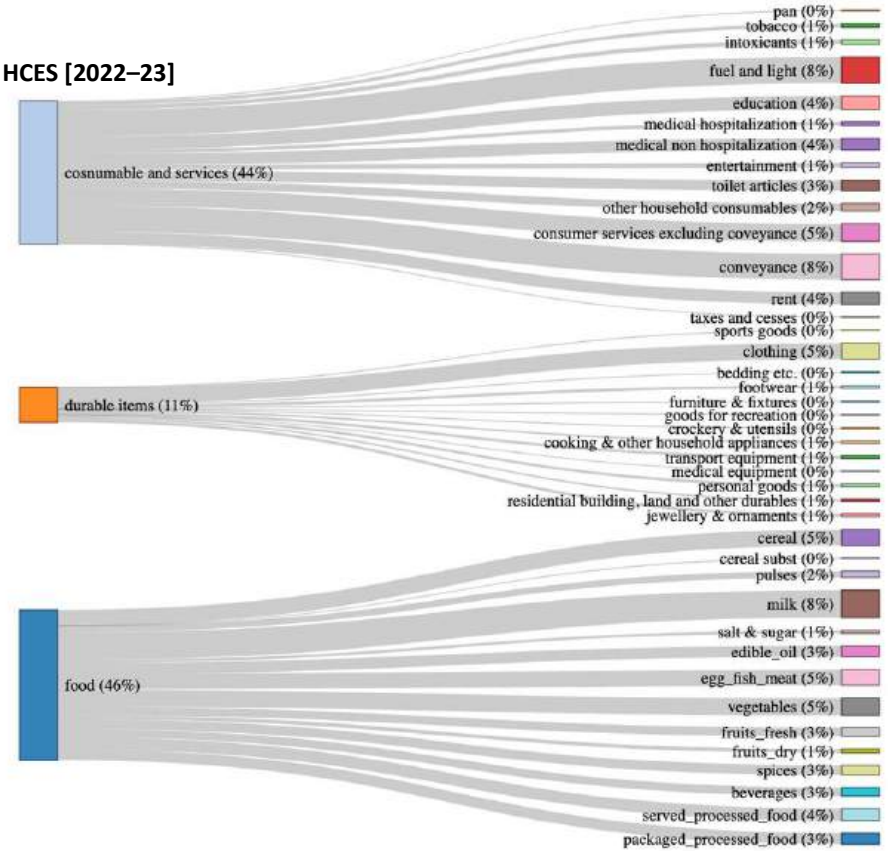


Urban: Bottom 50%

NSS [2011–12]

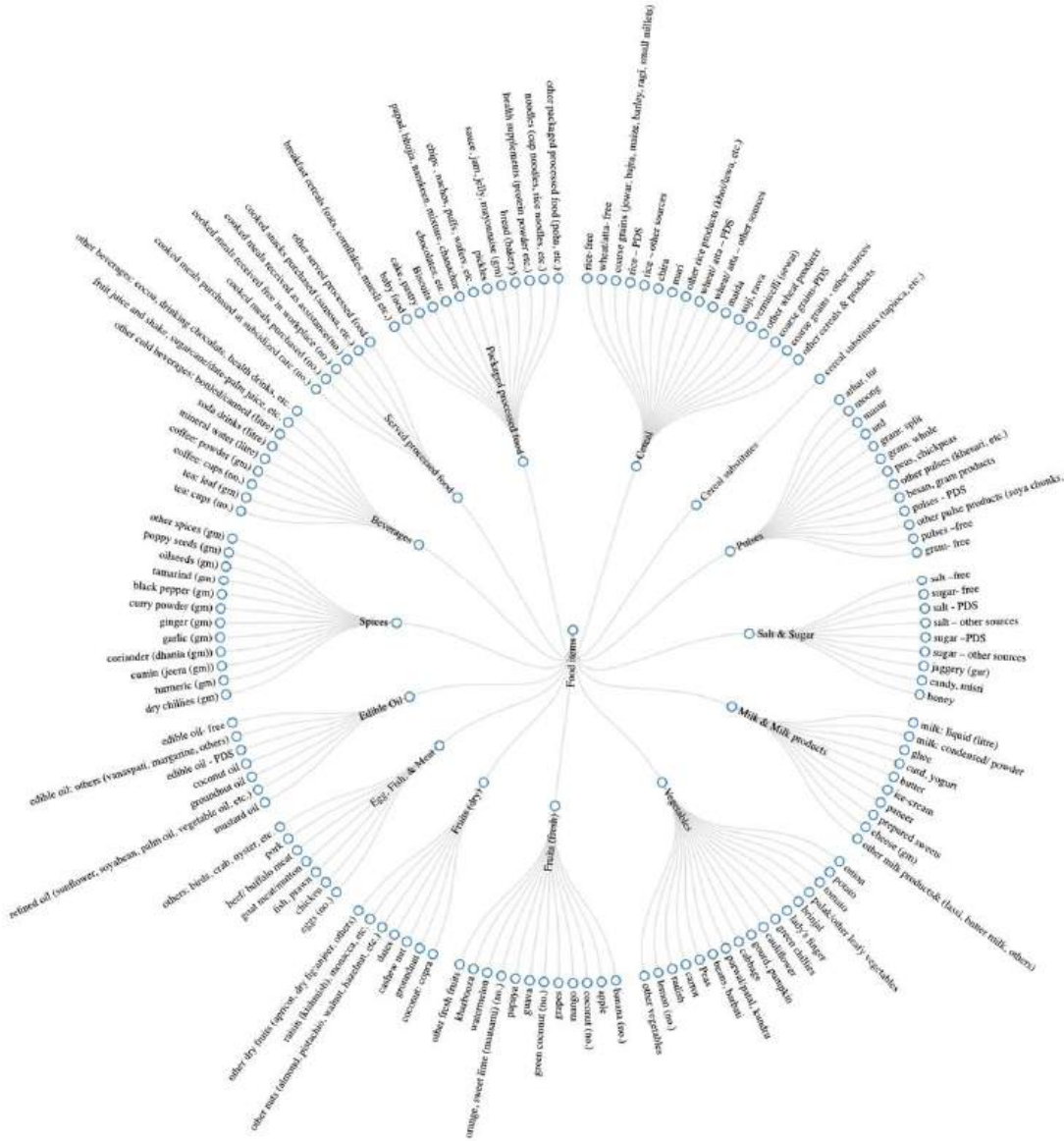


HCES [2022–23]

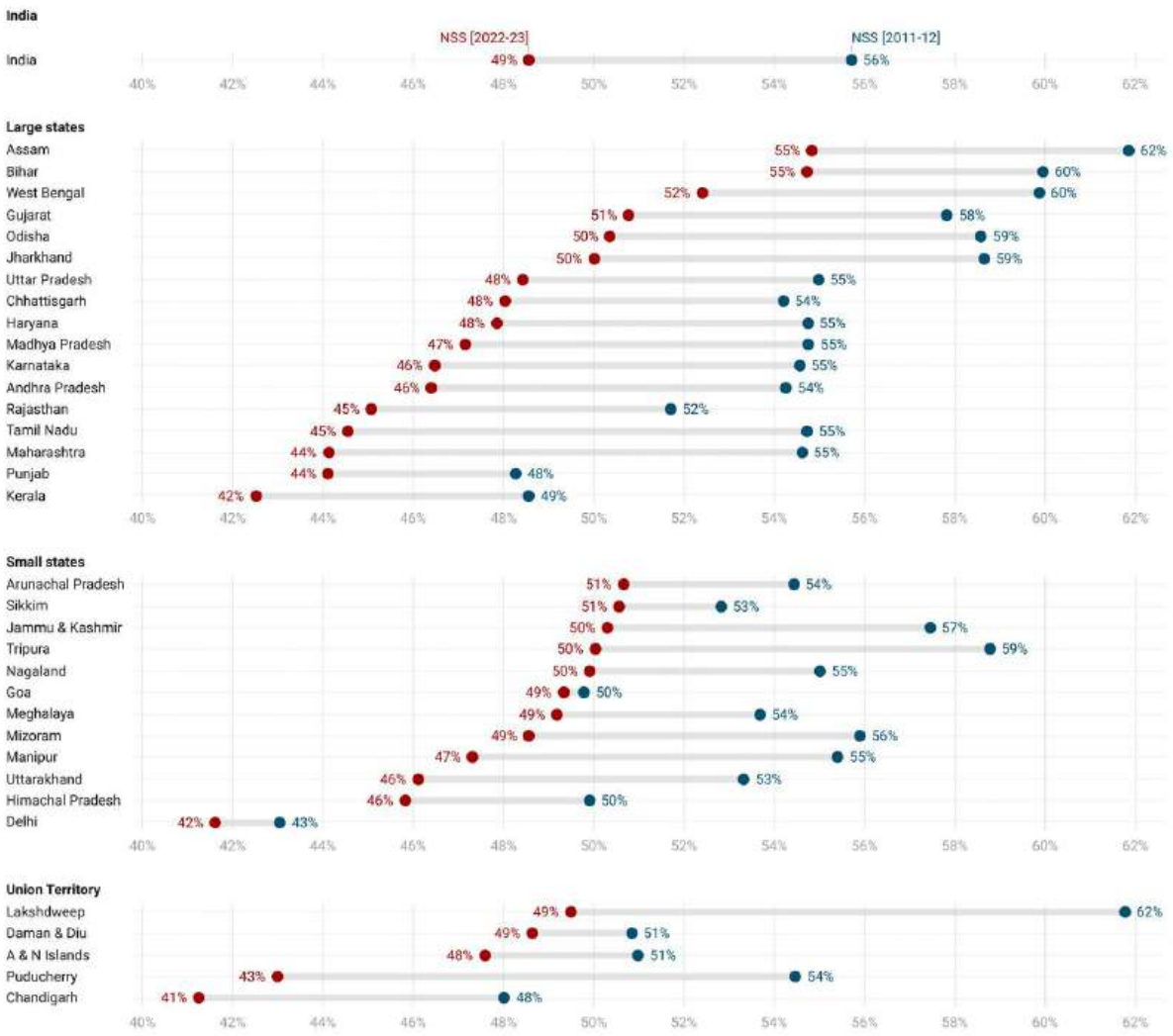


Analysis of the Food survey

Food groups & items



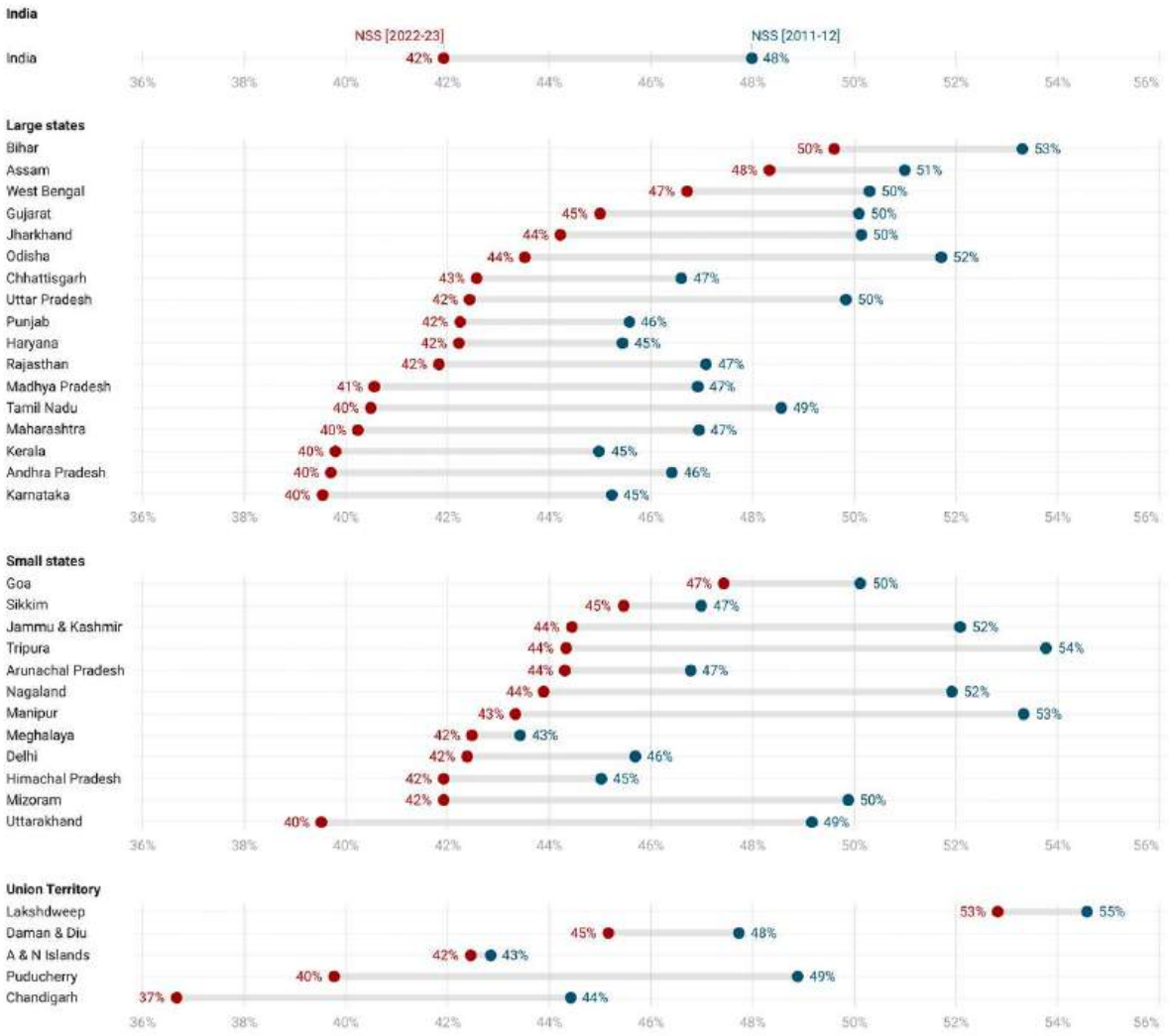
Proportion of Household Expenditure on Food items: Rural



The estimates are produced using the conventional frequentist-based approach.

Chart: Dr. Mudit Kapoor (EPU, ISI-Delhi Center) • Source: Ministry of Statistics and Programme Implementation • Created with Datawrapper

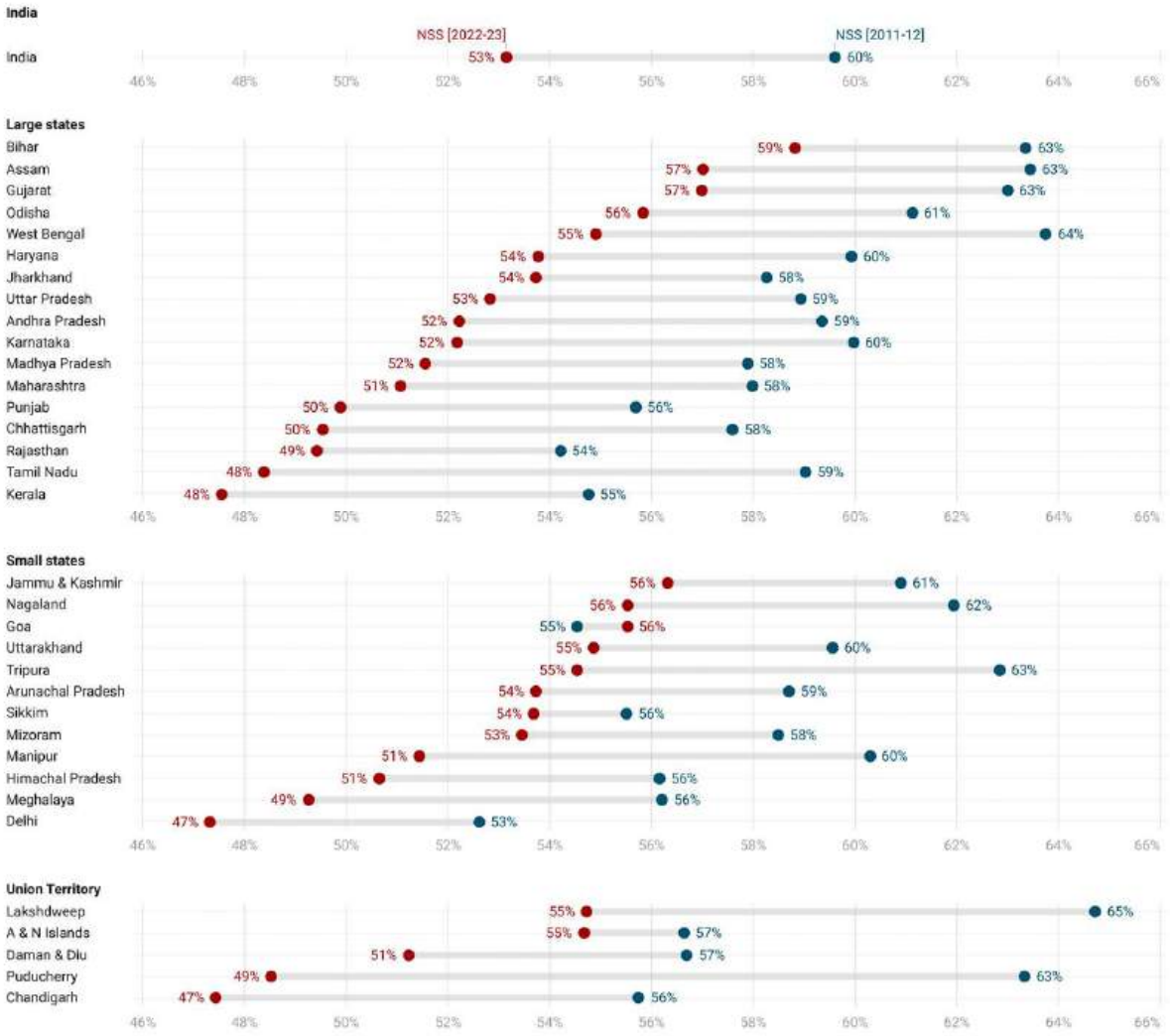
Proportion of Household Expenditure on Food items: Urban



The estimates are produced using the conventional frequentist-based approach.

Chart: Dr. Mudit Kapoor (EPU, ISI-Delhi Center) • Source: Ministry of Statistics and Programme Implementation • Created with Datawrapper

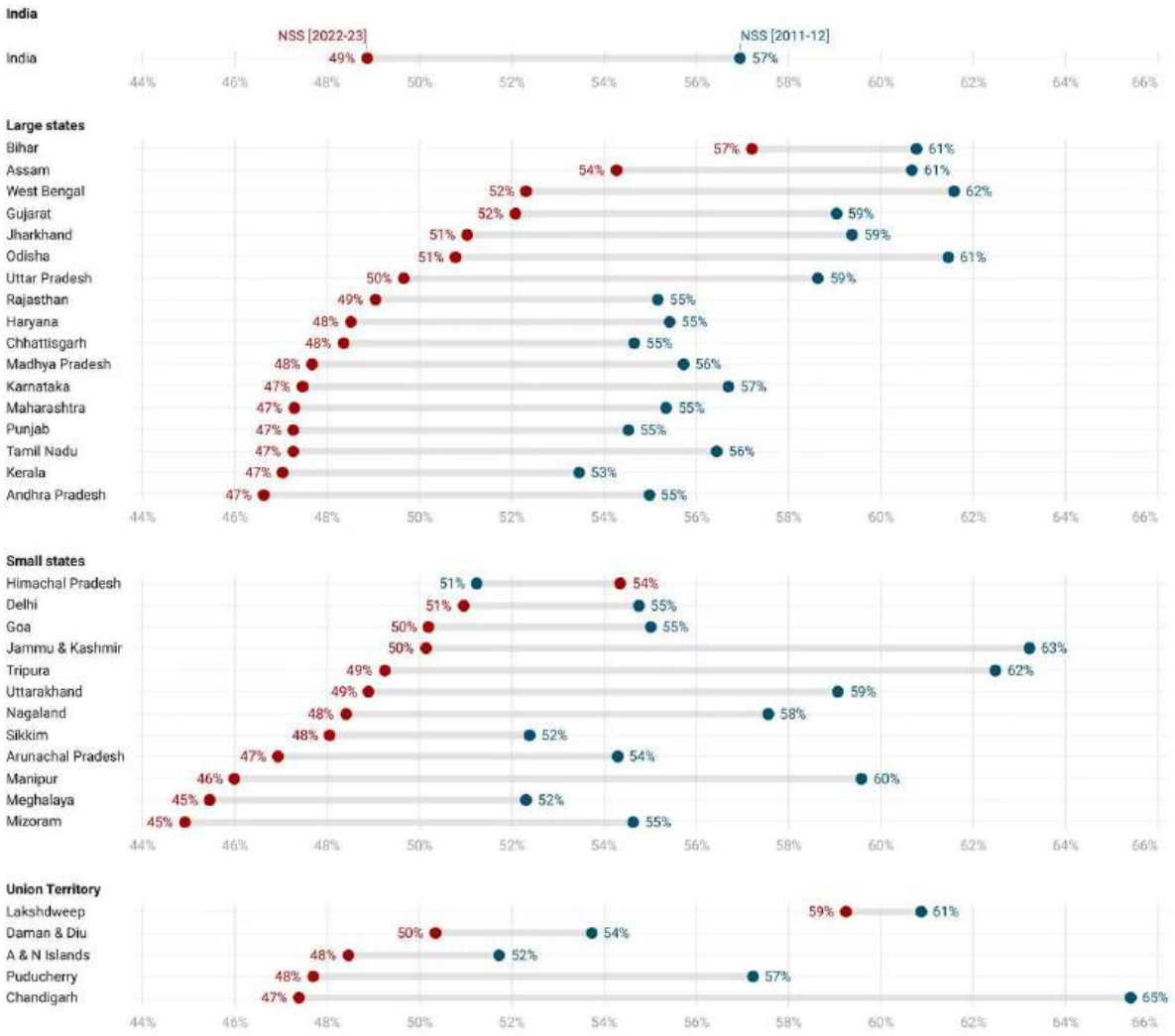
Proportion of Household Expenditure on Food items of the Poorest 20% households: Rural



The estimates are produced using the conventional frequentist-based approach.

Chart: Dr. Mudit Kapoor (EPU, ISI-Delhi Center) • Source: Ministry of Statistics and Programme Implementation • Created with Datawrapper

Proportion of Household Expenditure on Food items of the Poorest 20% households: Urban



The estimates are produced using the conventional frequentist-based approach.

Chart: Dr. Mudit Kapoor (EPU, ISI-Delhi Center) • Source: Ministry of Statistics and Programme Implementation • Created with Datawrapper

Proportion of Household Food Expenditure: Rural

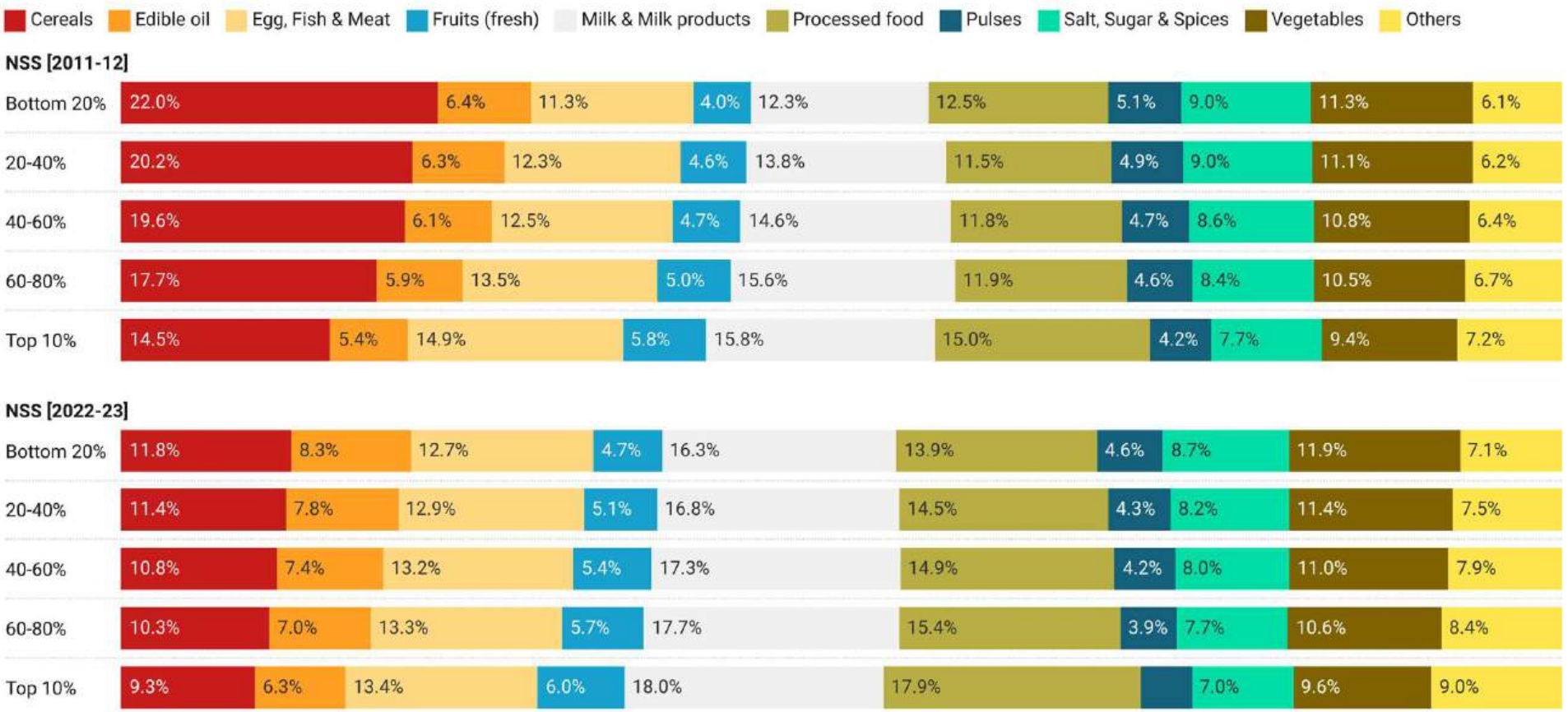


Chart: Dr. Mudit Kapoor (EPU, ISI–Delhi Center) • Source: Ministry of Statistics and Programme Implementation. Unit Level Data HCES [2022-23] & NSS [2011-12] • Created with Datawrapper

Proportion of Household Food Expenditure: Urban

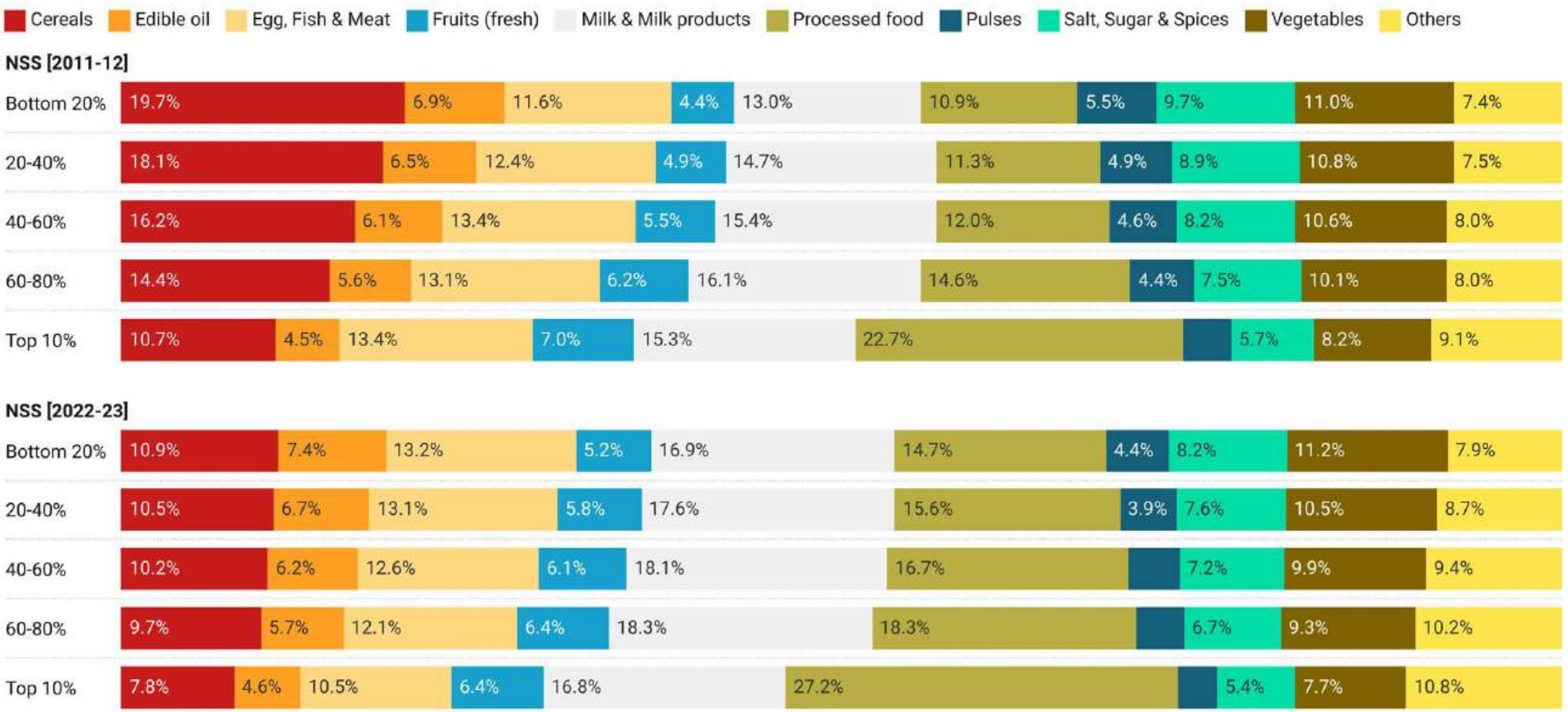
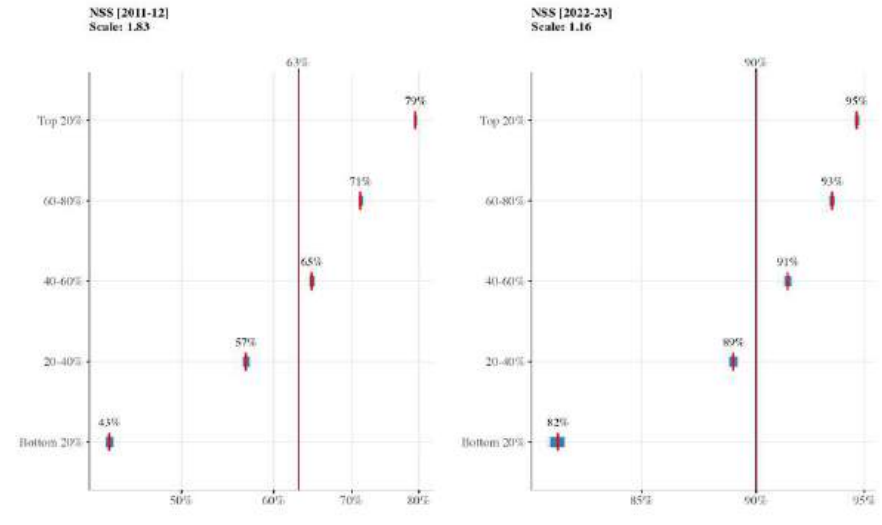


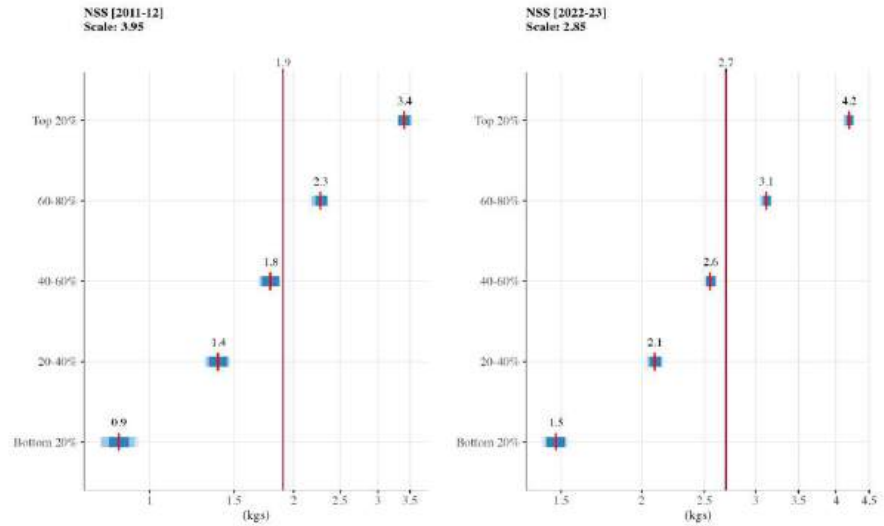
Chart: Dr. Mudit Kapoor (EPU, ISI–Delhi Center) • Source: Ministry of Statistics and Programme Implementation. Unit Level Data HCES [2022-23] & NSS [2011-12] • Created with Datawrapper

Proportion of Rural Households Consuming: Fruits (fresh)



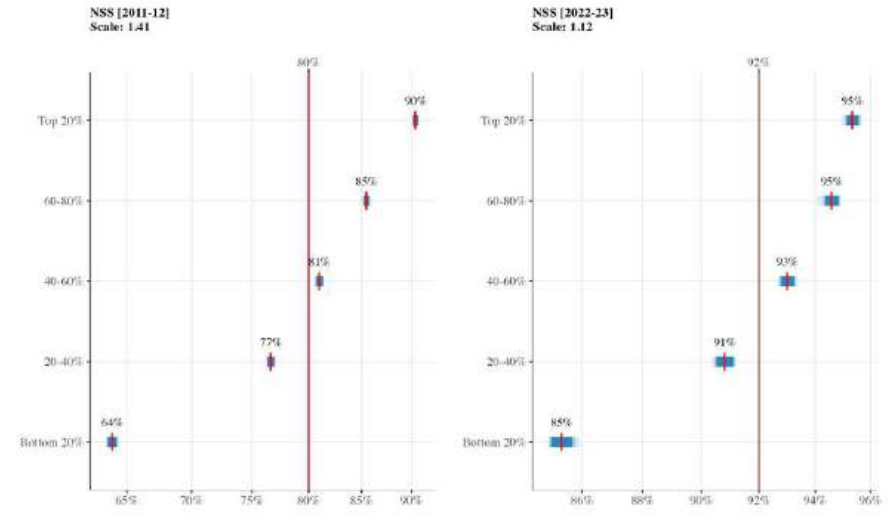
Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Quantity of consumption (per Adult Female Equivalent) Rural Household: Fruits (fresh)



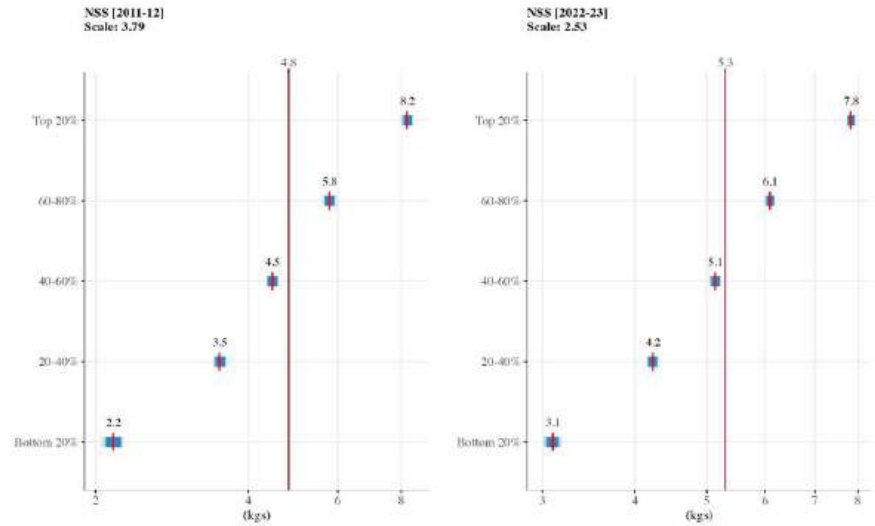
Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Proportion of Rural Households Consuming: Milk & Milk products



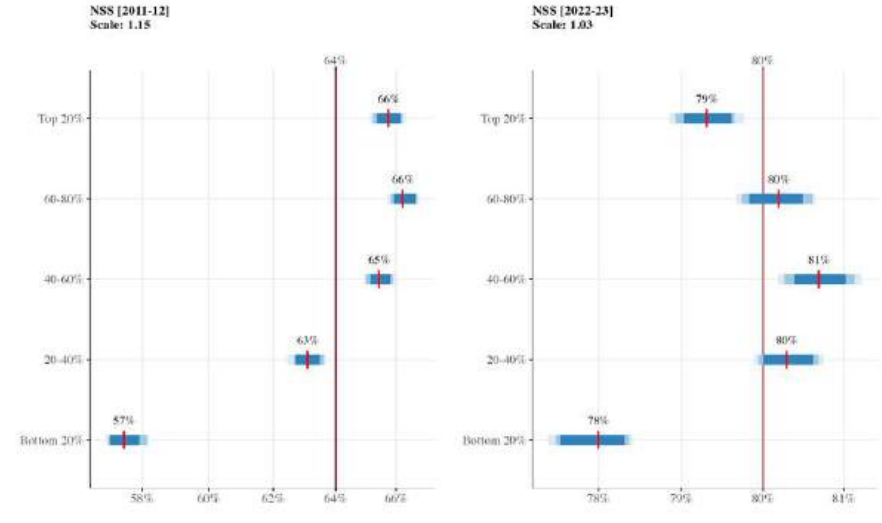
Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Quantity of consumption (per Adult Female Equivalent) Rural Household: Milk & Milk products



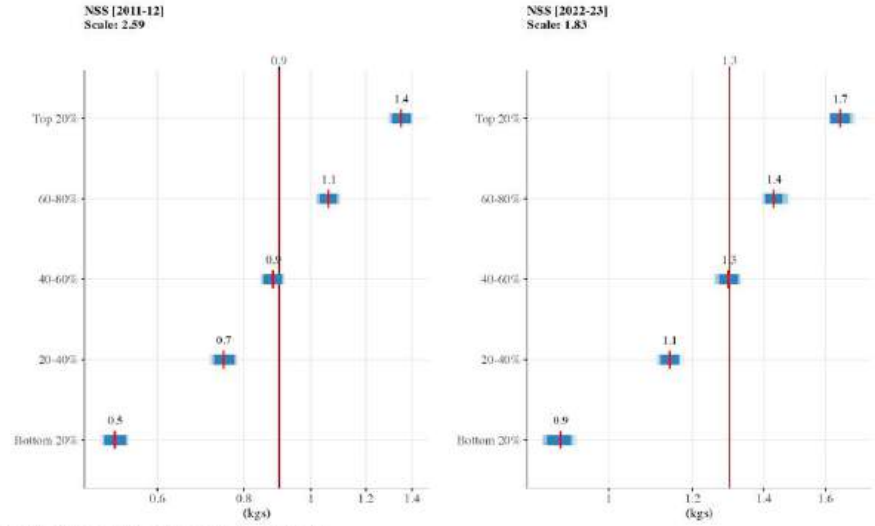
Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Proportion of Rural Households Consuming: Egg, Fish & Meat



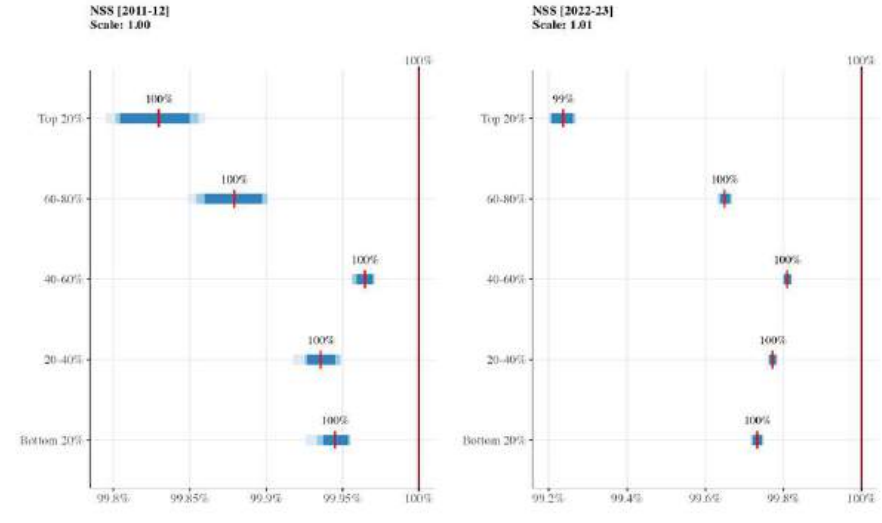
Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Quantity of consumption (per Adult Female Equivalent) Rural Household: Egg, Fish & Meat



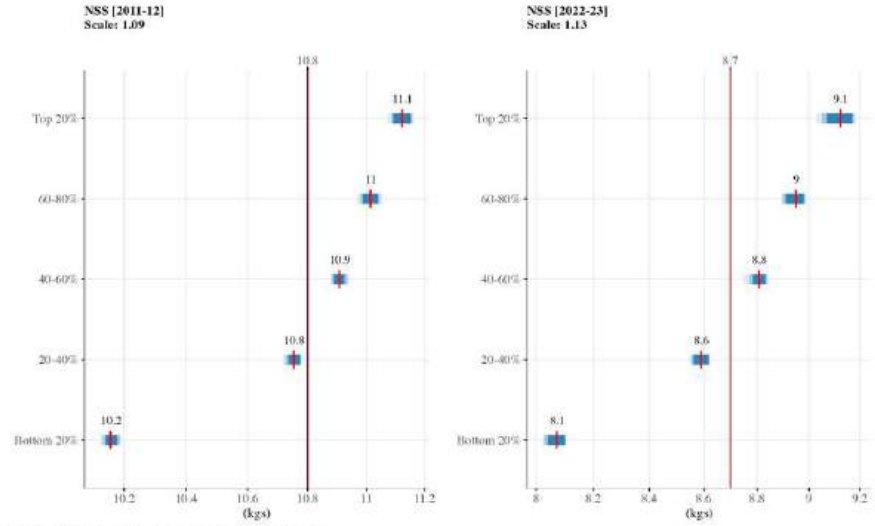
Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Proportion of Rural Households Consuming: Cereals



Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Quantity of consumption (per Adult Female Equivalent) Rural Household: Cereals



Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

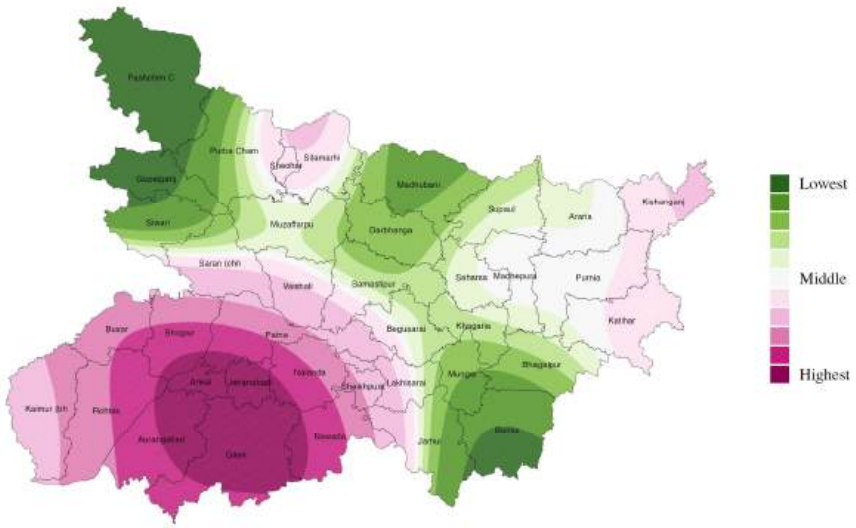
Poorest or Bottom 20% of the Households

Bottom 20% Households

- From a policy perspective these households might need the maximum government support
- Concentration of the Bottom 20% households across states could be different
    - This necessitates rethink in areas with states that might need more focused government attention

Bihar: Concentration of the Bottom 20% households

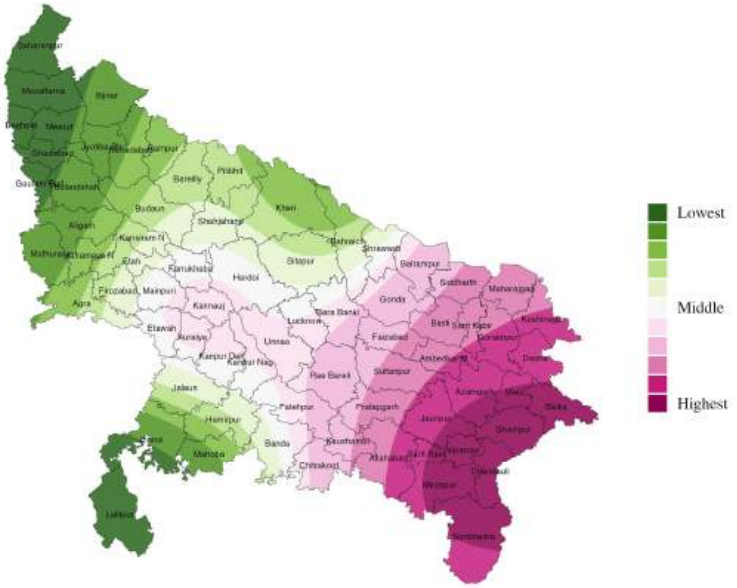
NSS [2022-23] (Per million people)



Analysis based on the Unit Level Data was done by the authors.
Data source: Unit level data from the Household Consumer and Expenditure Survey, 2022-23 & 2011-12.
Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center)

Uttar Pradesh: Concentration of the Bottom 20% households

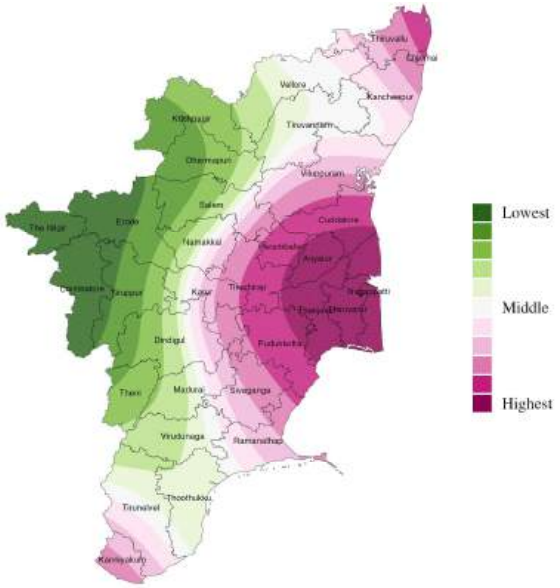
NSS [2022-23] (Per million people)



Analysis based on the Unit Level Data was done by the authors.
Data source: Unit level data from the Household Consumer and Expenditure Survey, 2022-23 & 2011-12.
Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center)

Tamil Nadu: Concentration of the Bottom 20% households

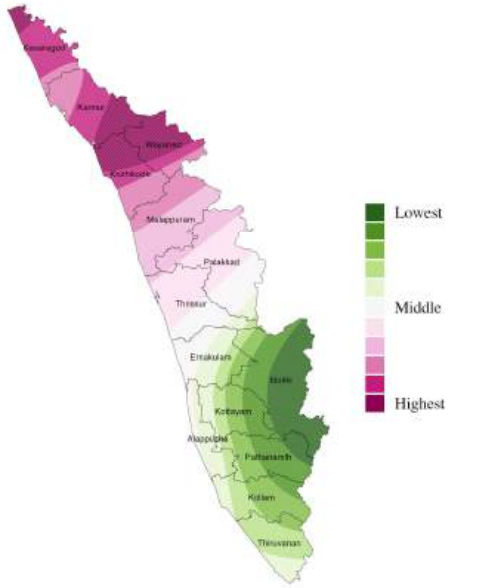
NSS [2022-23] (Per million people)



Analysis based on the Unit Level Data was done by the authors.
Data source: Unit level data from the Household Consumer and Expenditure Survey, 2022-23 & 2011-12.
Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center)

Kerala: Concentration of the Bottom 20% households

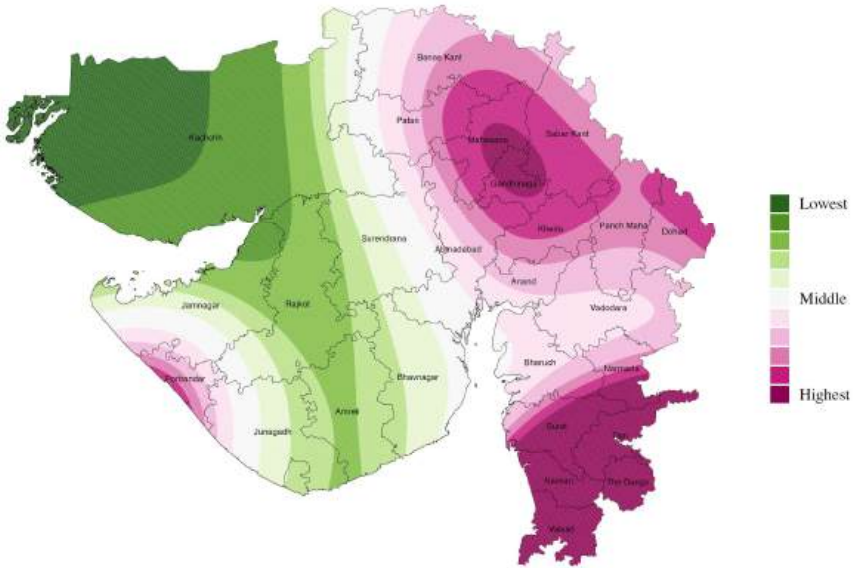
NSS [2022-23] (Per million people)



Analysis based on the Unit Level Data was done by the authors.
Data source: Unit level data from the Household Consumer and Expenditure Survey, 2022-23 & 2011-12.
Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center)

Gujarat: Concentration of the Bottom 20% households

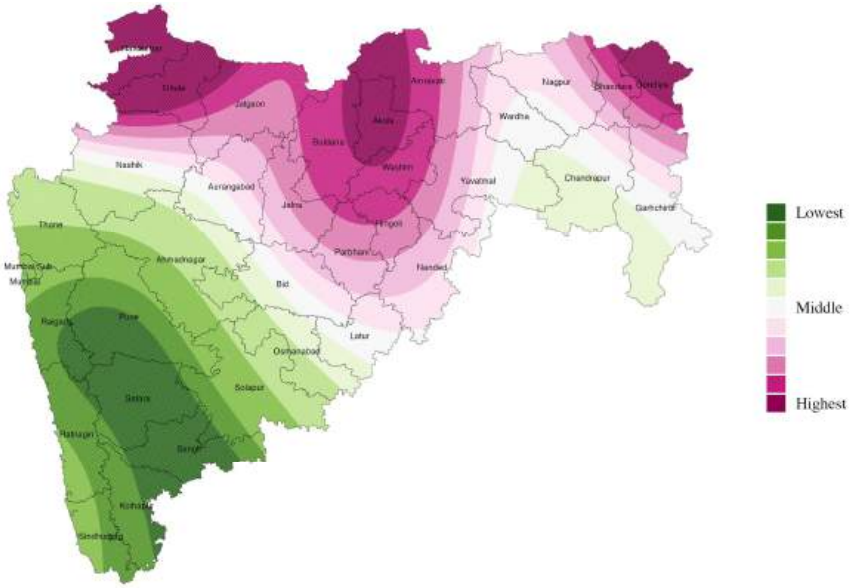
NSS [2022-23] (Per million people)



Analysis based on the Unit Level Data was done by the authors.
Data source: Unit level data from the Household Consumer and Expenditure Survey, 2022-23 & 2011-12.
Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center)

Maharashtra: Concentration of the Bottom 20% households

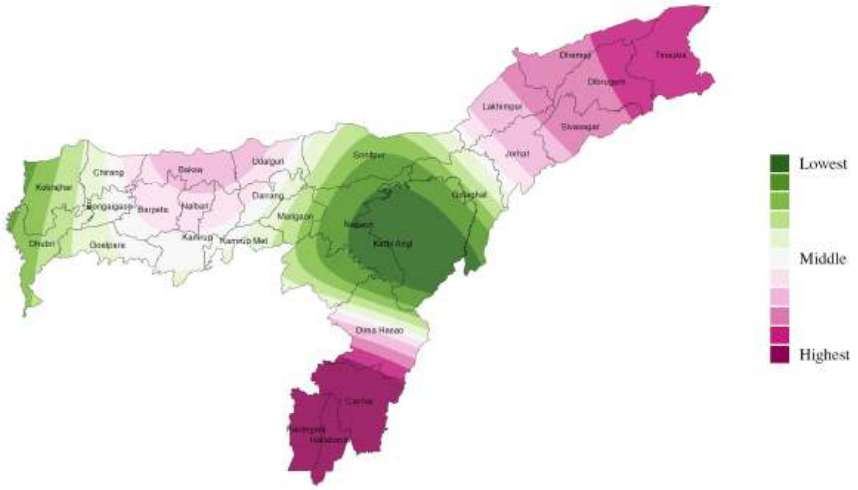
NSS [2022-23] (Per million people)



Analysis based on the Unit Level Data was done by the authors.
Data source: Unit level data from the Household Consumer and Expenditure Survey, 2022-23 & 2011-12.
Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center)

Assam: Concentration of the Bottom 20% households

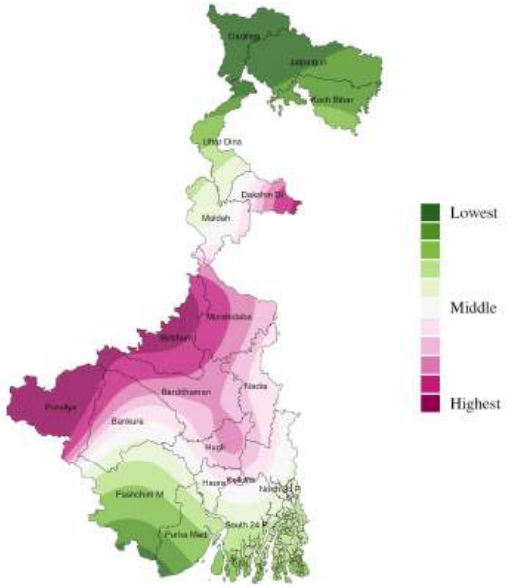
NSS [2022-23] (Per million people)



Analysis based on the Unit Level Data was done by the authors.
Data source: Unit level data from the Household Consumer and Expenditure Survey, 2022-23 & 2011-12.
Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center)

West Bengal: Concentration of the Bottom 20% households

NSS [2022-23] (Per million people)



Analysis based on the Unit Level Data was done by the authors.
Data source: Unit level data from the Household Consumer and Expenditure Survey, 2022-23 & 2011-12.
Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center)

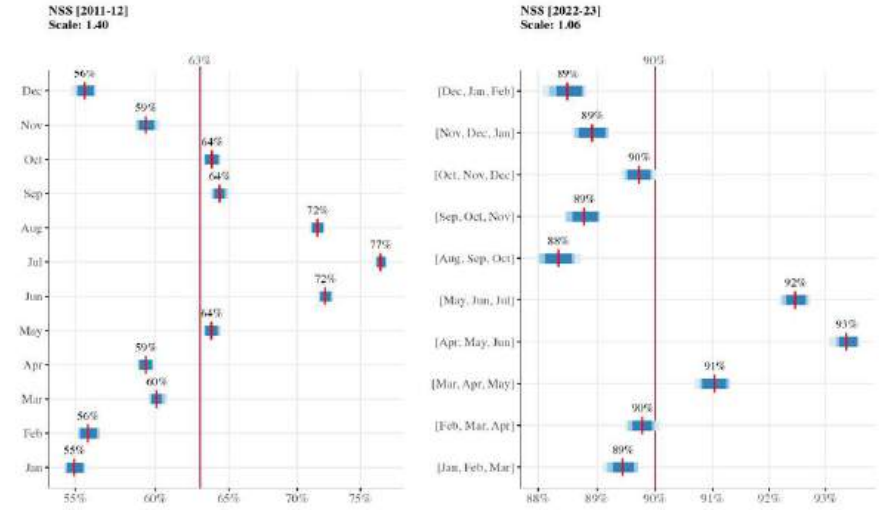
Seasonality

- Rural and Urban
- Proportions and Quantity
    - Fruits (fresh)
    - Milk & Milk products
    - Egg, Fish & Meat
    - Vegetables
    - Vegetables without Potatoes & Onions
    - Cereals
- Our Analysis is based on multi-level models

Multi-level Models

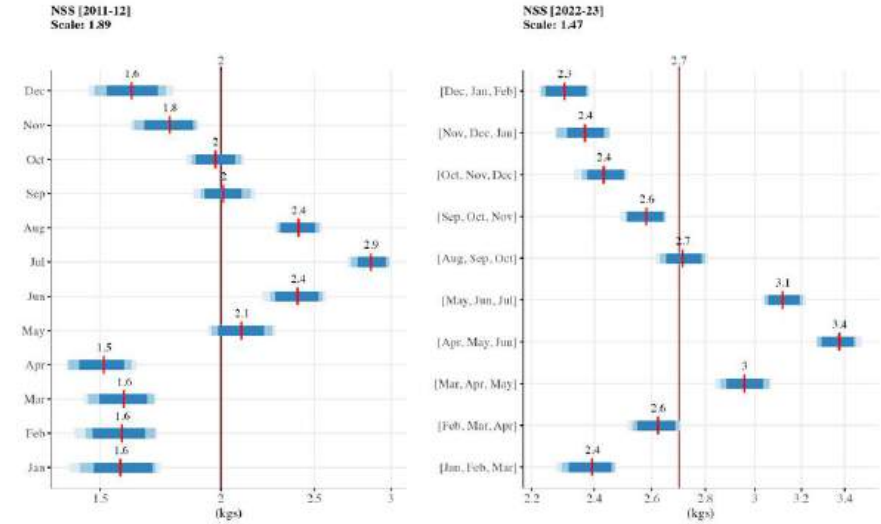
- We use an additive Model
- Random Effects
  - State level
  - Sector (Rural/Urban)
  - Consumption class (Bottom 20%, 20-40%, 40-60%, 60-80%, Top 10%)
  - Panel
  - The numbers in the charts have been rounded to one digit

Proportion of Rural Households Consuming: Fruits (fresh)



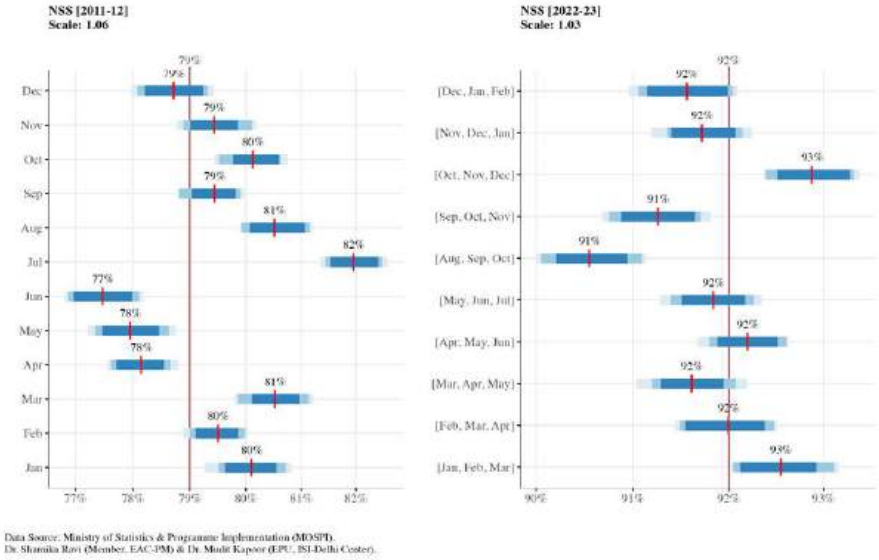
Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Quantity of consumption (per Adult Female Equivalent) Rural Household: Fruits (fresh)



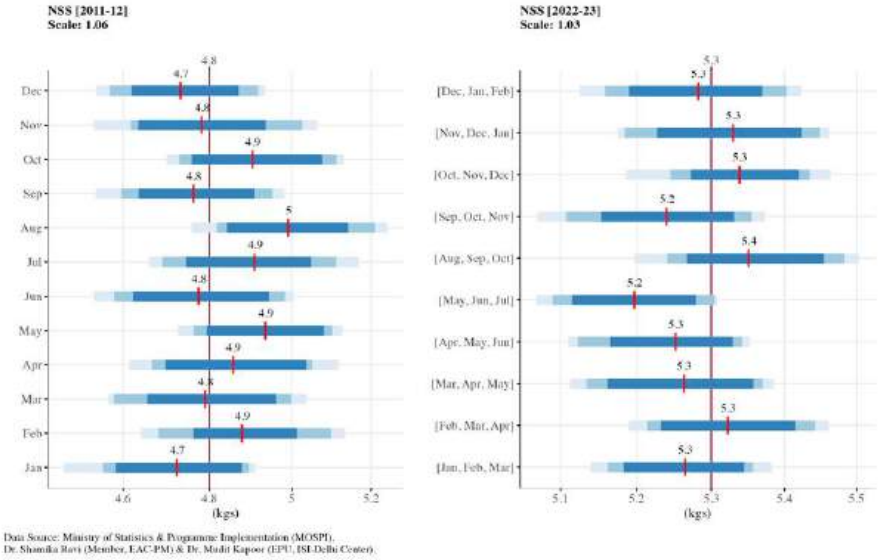
Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Proportion of Rural Households Consuming: Milk & Milk products



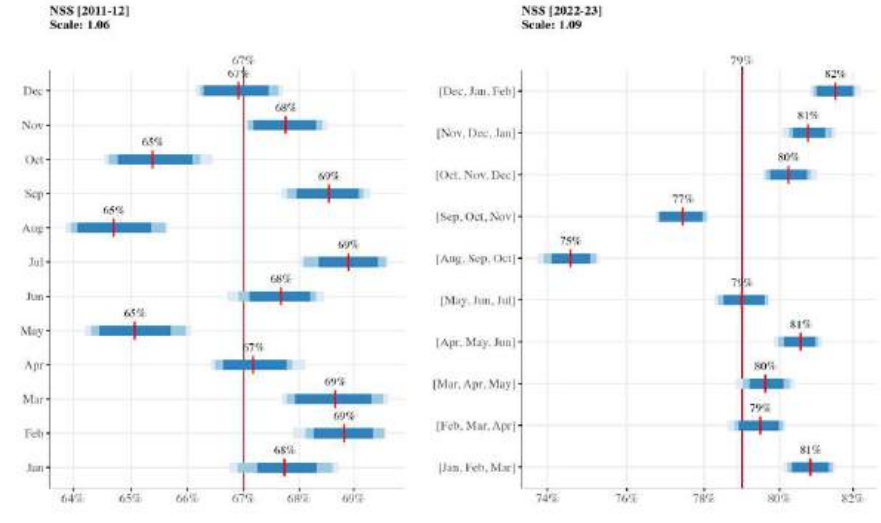
Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Quantity of consumption (per Adult Female Equivalent) Rural Household: Milk & Milk products



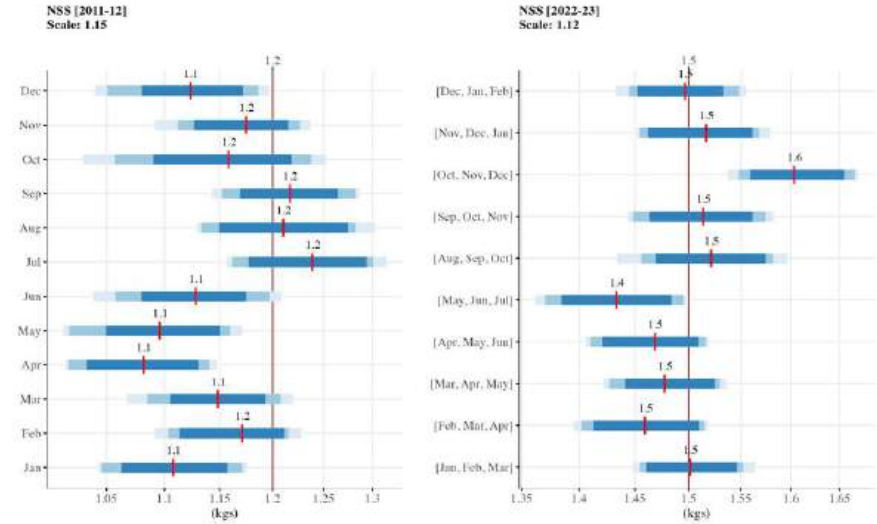
Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Proportion of Urban Households Consuming: Egg, Fish & Meat



Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Quantity of consumption (per Adult Female Equivalent) Urban Household: Egg, Fish & Meat



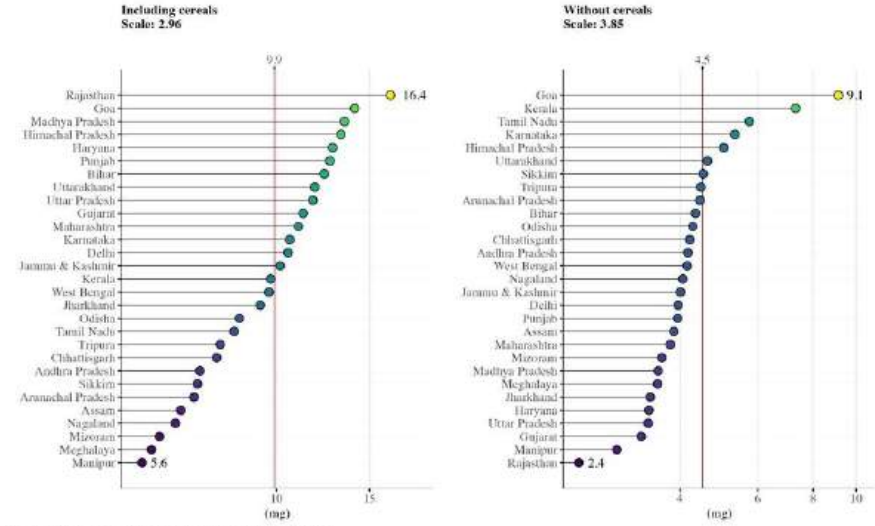
Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Micronutrient Analysis

Micronutrients

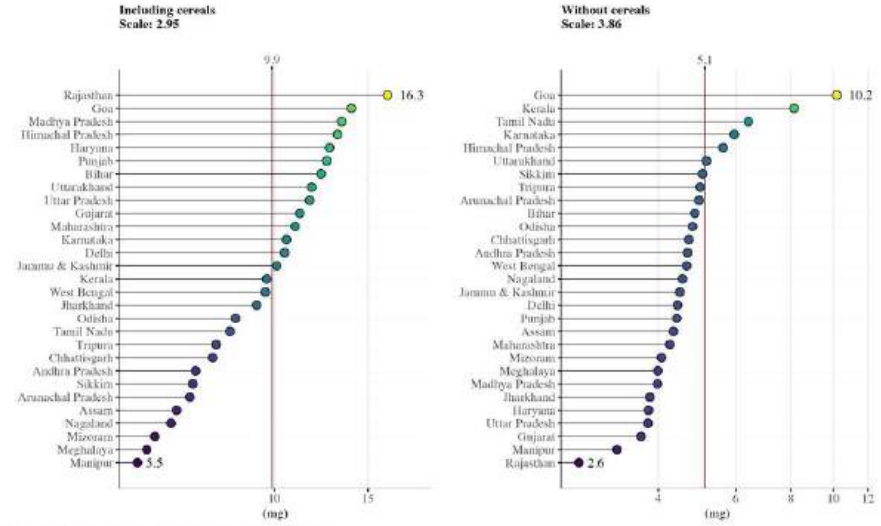
- Iron
- Zinc
- Vitamin A
- Folate
- Vitamin B12
- Vitamin B6
- Average daily intake per Adult Female Equivalent (AFE)

Iron: Average intake (per Adult Female Equivalent) Rural Household



Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Iron: Average intake (per Adult Female Equivalent) Urban Household

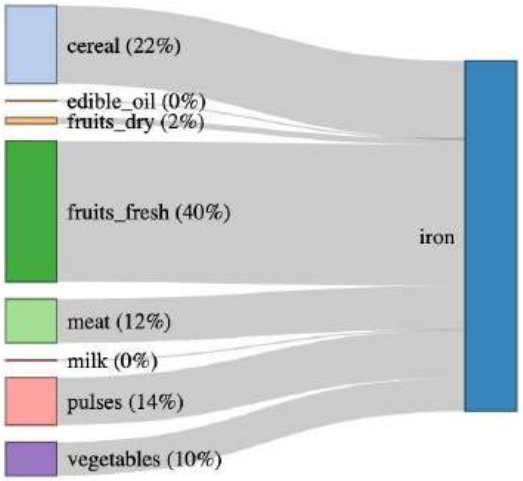


Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

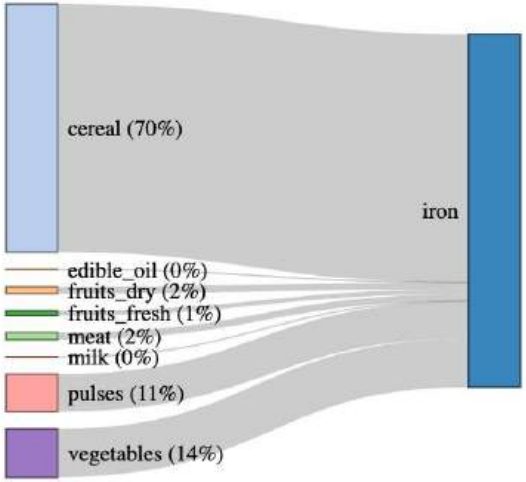
Exploratory Analysis of Dietary Diversity on Micronutrient intake

Iron: Dietary diversity source

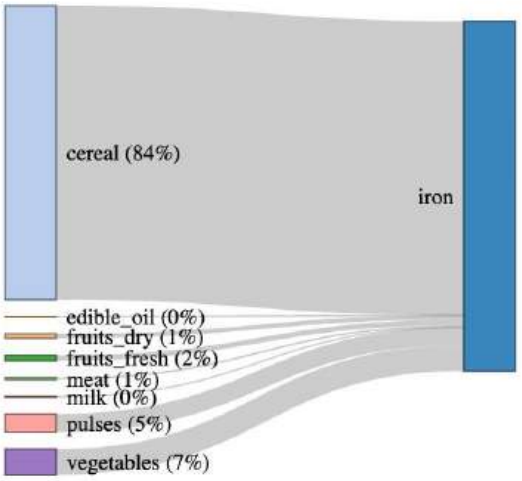
Kerala



Uttar Pradesh



Rajasthan



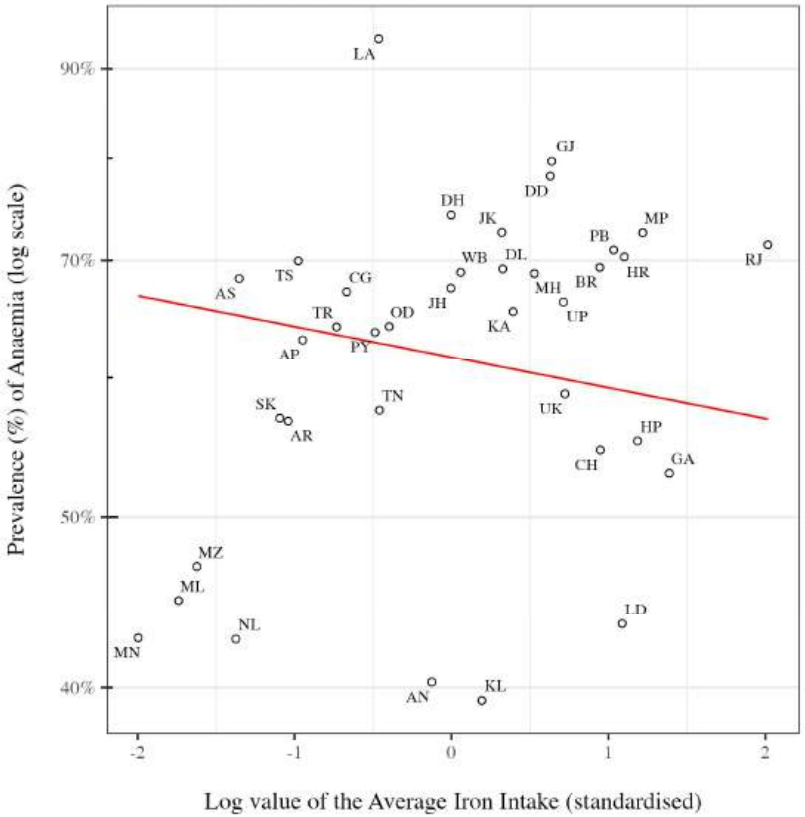
Prevalence of Anaemia, Average Iron Intake and Dietary Diversity (Shannon Diversity Index)

Exploratory Analysis

- We explore the relation between prevalence of Anaemia, Average iron intake, and the Shannon Diversity Index for the source of iron at the state level
  - The data for prevalence of Anaemia is from the NFHS report 2019–21
  - Average Iron Intake and Shannon Diversity Index for the iron intake are estimated from the regression analysis based on the unit level data from the Household Consumption Expenditure Survey 2022–23
  - For Prevalence of Anaemia, we consider
    - Children (6 to 59 months)
    - Women (15 to 49 years)

Relationship between prevalence of Anaemia and Average Iron intake

Children (6 to 59 months): State

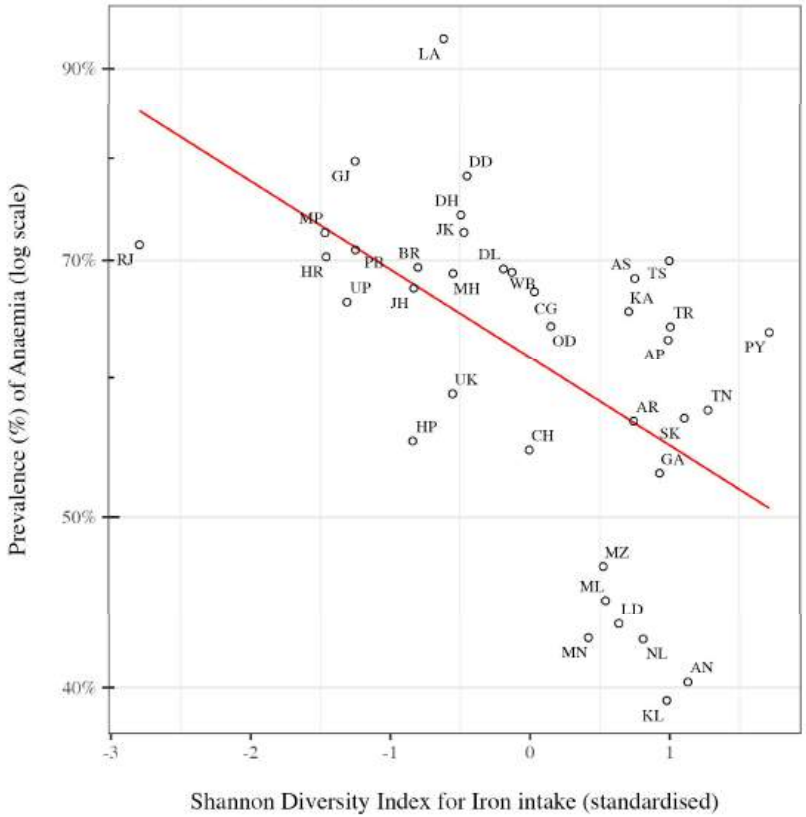


Log value of the Average Iron Intake (standardised)

Note: The red line is the regression line adjusting for the shannon diversity index at the mean value.
We adjust for regional variations by using a multi-level model.
Data source: Data on prevalence of Anaemia is from NFHS5 (2019-21).
Data on Shannon diversity index is computed based on analysis of unit level data from HCES 2022-23.
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi).

Relationship between prevalence of Anaemia and Shannon Diversity Index for Iron intake

Children (6 to 59 months): State



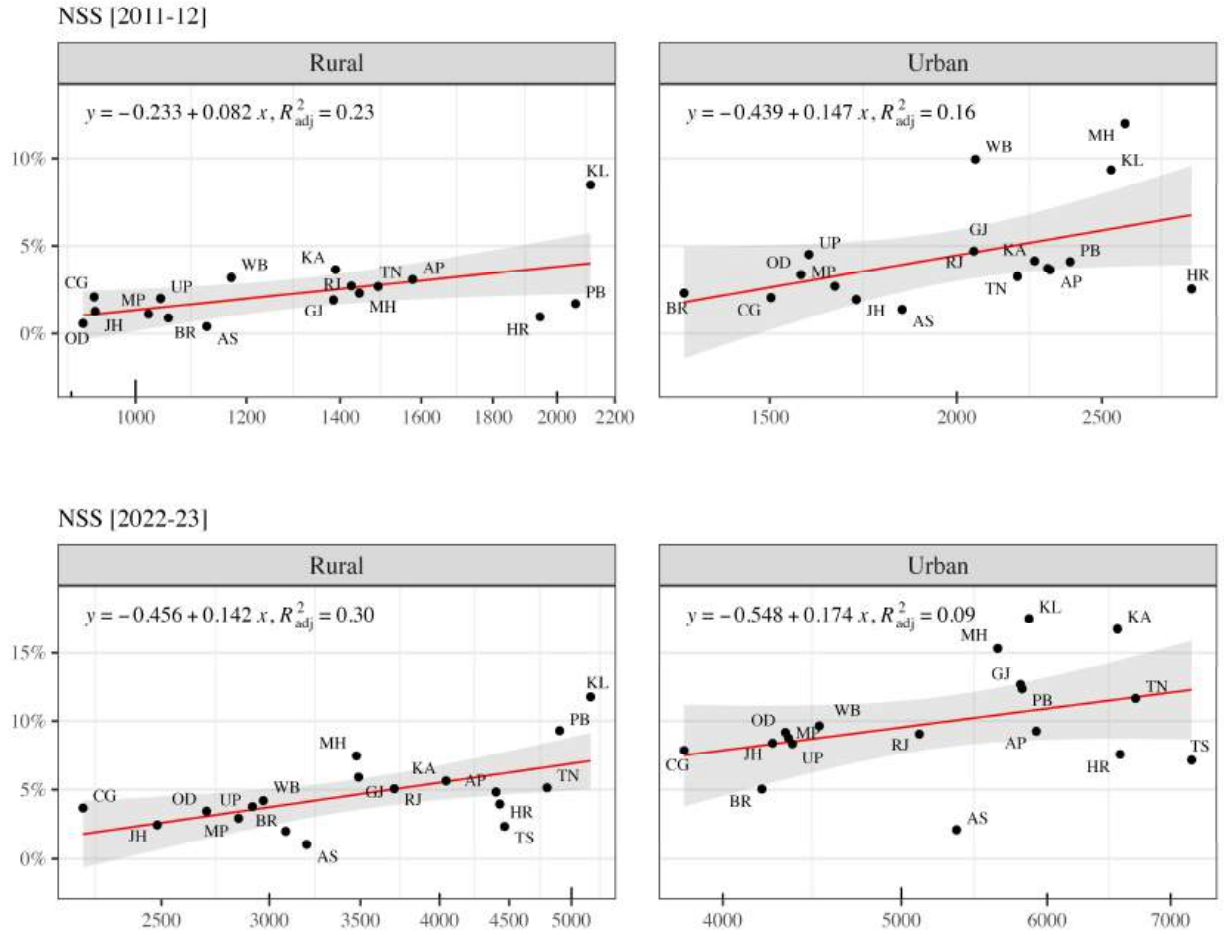
Shannon Diversity Index for Iron intake (standardised)

Note: The red line is the regression line adjusting for the average iron intake at the mean value.
We adjust for regional variations by using a multi-level model.
Data source: Data on prevalence of Anaemia is from NFHS5 (2019-21).
Data on Shannon diversity index is computed based on analysis of unit level data from HCES 2022-23.
Dr. Shamika Ravi (Member, EAC-PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi).

Data Quality

Association between probability of substitution and Expected MPCE across states

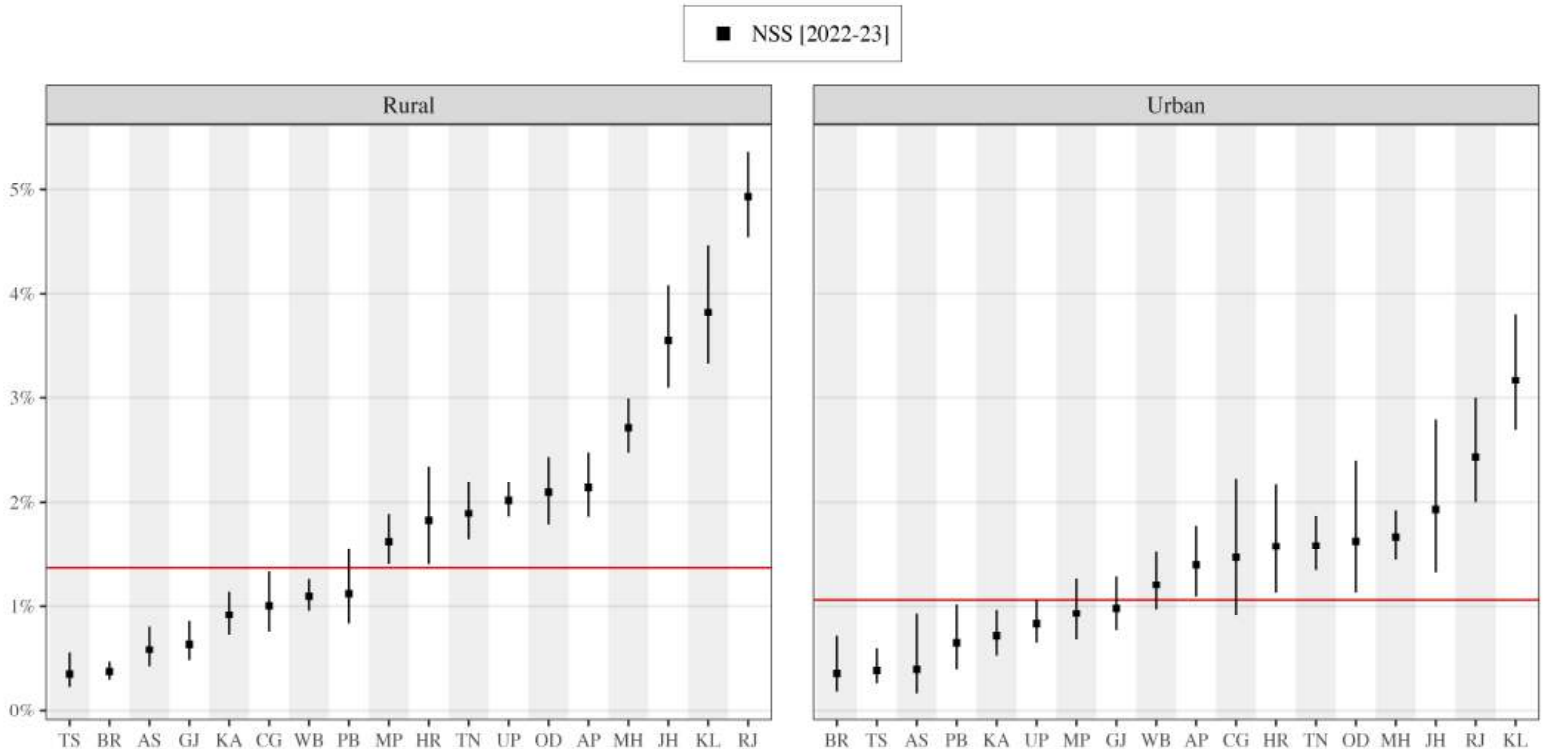
Large states



Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC to PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Proportion of Households with differing household size across visits

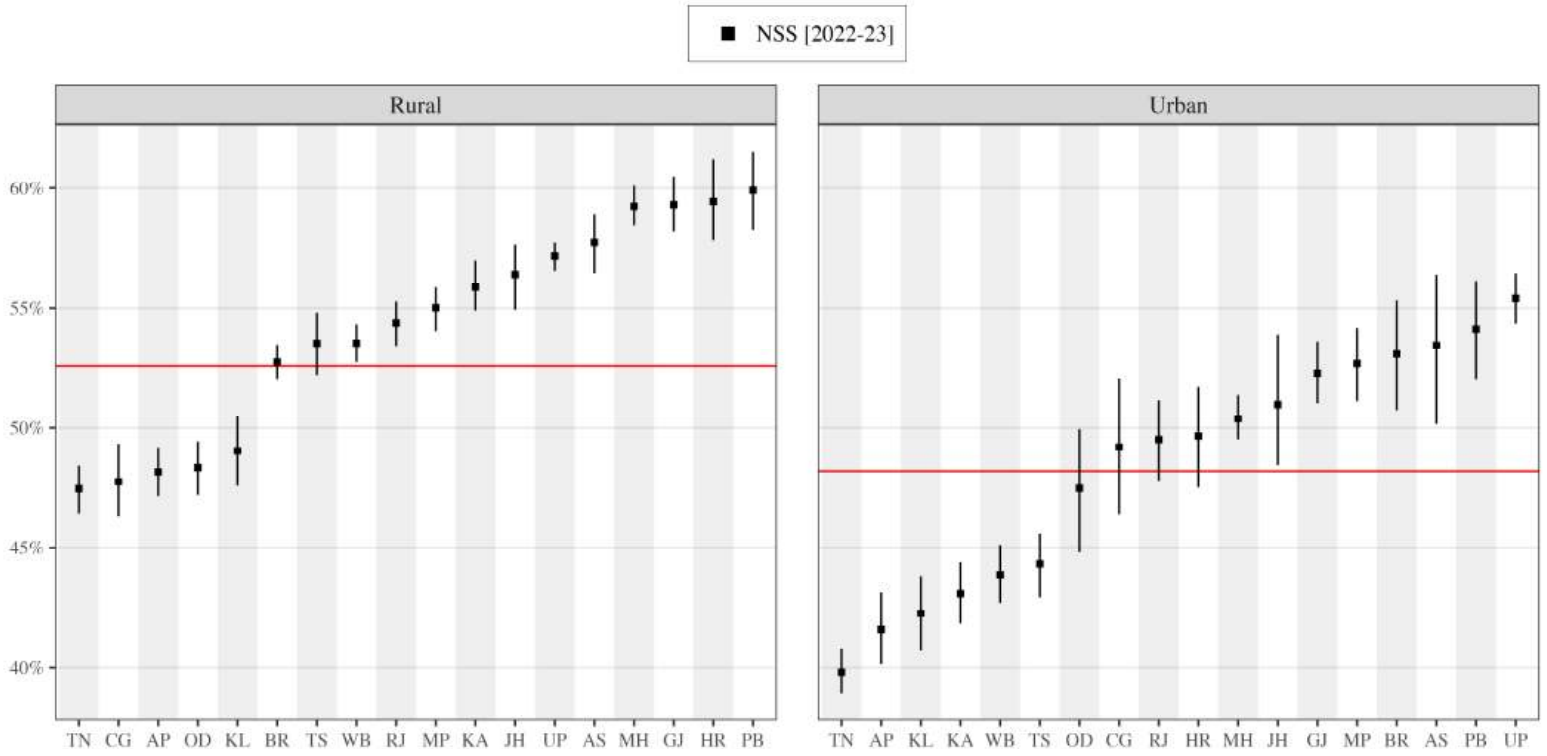
Large states



Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC to PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Proportion of Households with differing respondents across visits

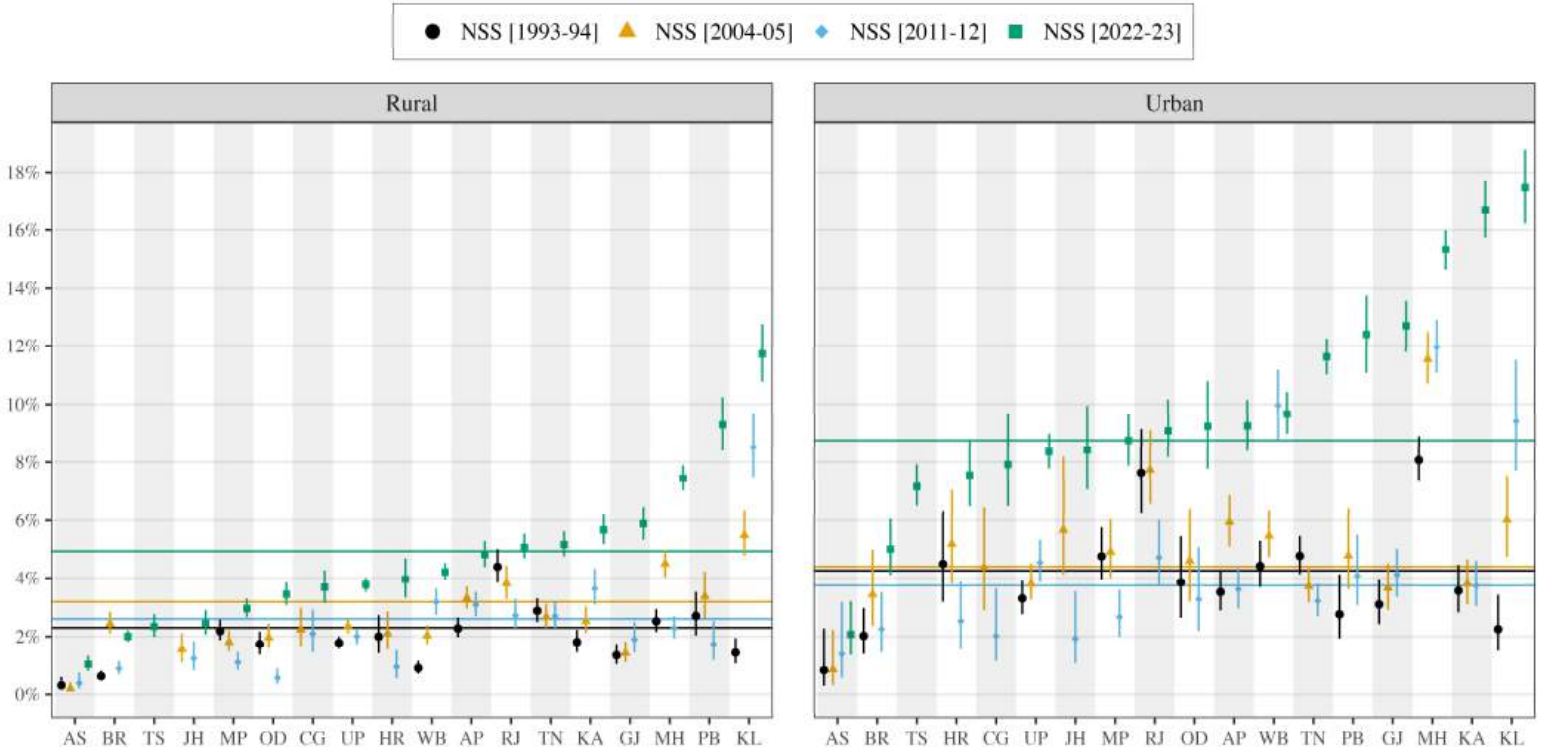
Large states



Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC to PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Proportion of Households substituted

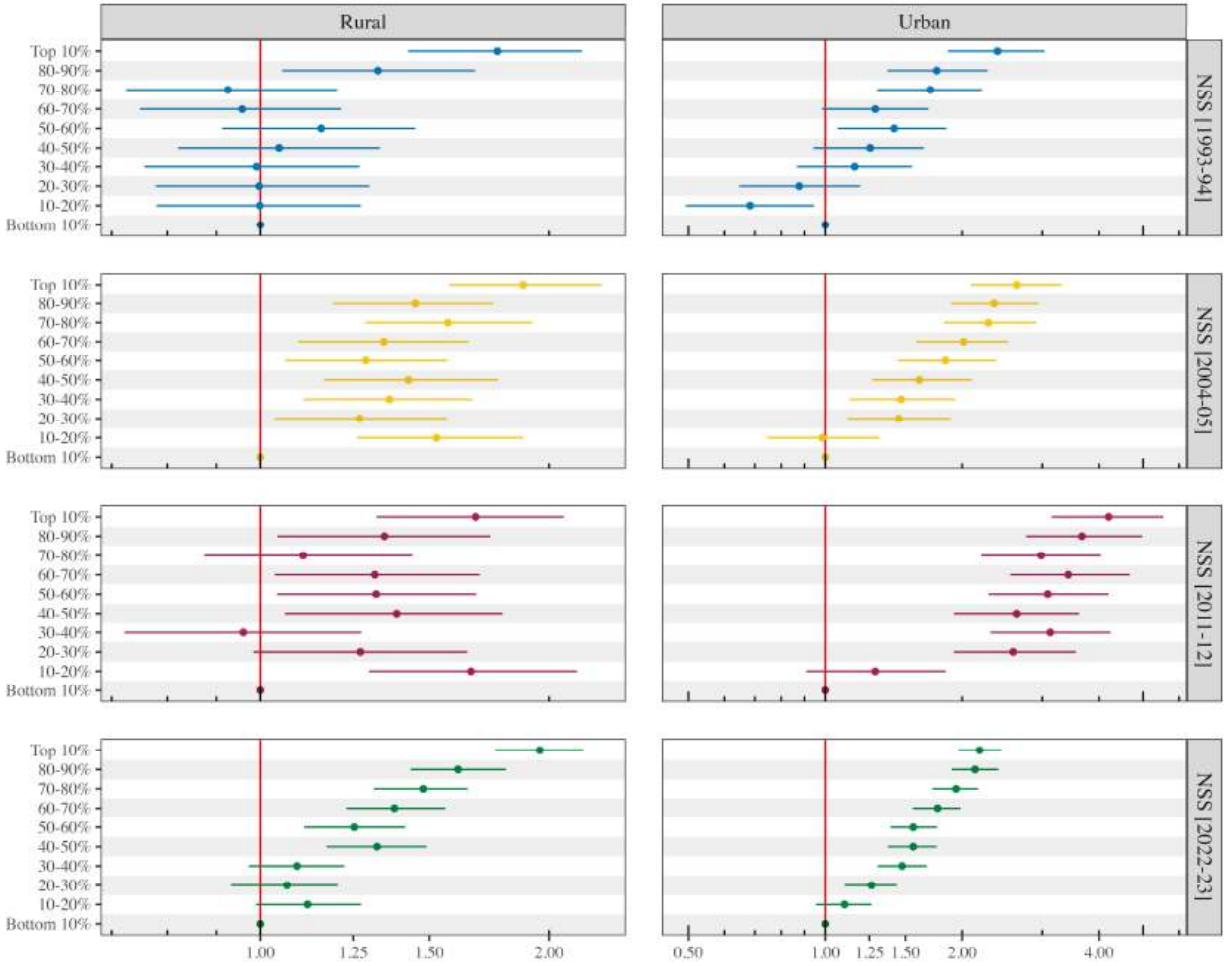
Large states



Data Source: Ministry of Statistics & Programme Implementation (MOSPI).
Dr. Shamika Ravi (Member, EAC to PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Odds Ratio of substitution of Household across consumption class

Bottom 10% (reference category)



Data Source: Ministry of Statistics & Programme Implementation (MOSPI).

Dr. Shamika Ravi (Member, EAC to PM) & Dr. Mudit Kapoor (EPU, ISI-Delhi Center).

Thank you

A Integrated National Data System in Support of Viksit Bharat

Presentation to COCSSO 13 August 2024

India Poverty & Equity Team

WORLD BANK GROUP

To achieve India @ 2047 goals, a state-of-the-art data ecosystem is needed to drive growth, innovation and evidence-based policies...

Real time economic monitoring of the business environment and economic trends

Socio-economic and labor dynamics and insights into the changing nature of work

Monitoring social scheme performance to improve spending and beneficiary targeting

Natural resource accounts to manage depletion, pollution, and the impact of climate change

State and District Data for localized policy and planning

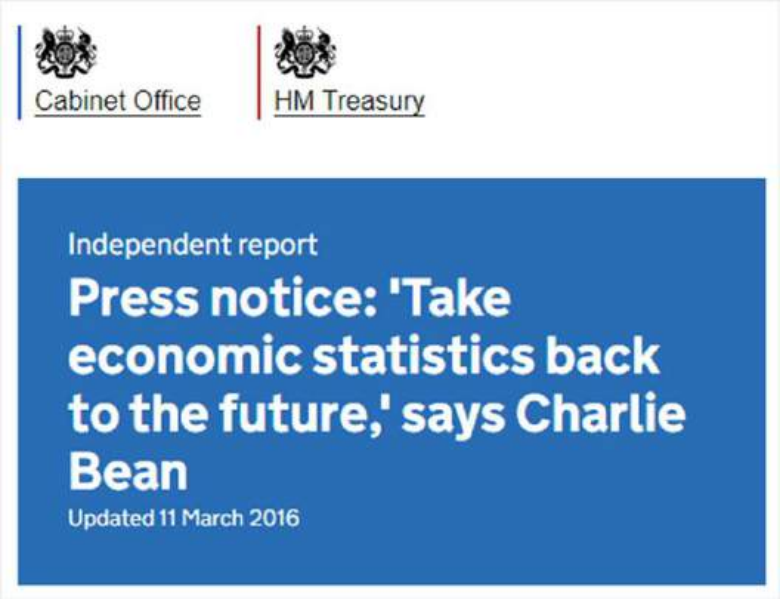
Linking Public Expenditure to Outputs and Outcomes

Output-Outcome Monitoring Framework rolled out across the Central Government in 2017-18 – facing serious data discrepancies & quality issues esp. at lower levels

Example: United Kingdom

Building a culture of innovation and frontier capabilities

- The UK's 2015/16 independent review of economic statistics (the "Bean Report") found that a culture shift was needed to produce economic statistics for a modern economy
- It recommended the Office of National Statistics set up a hub to harness the power of big data
- In 2017, the Data Science Campus was launched to strengthen expertise in data science across the government – "enabling quick, clear and relevant insight on the public issues at hand"

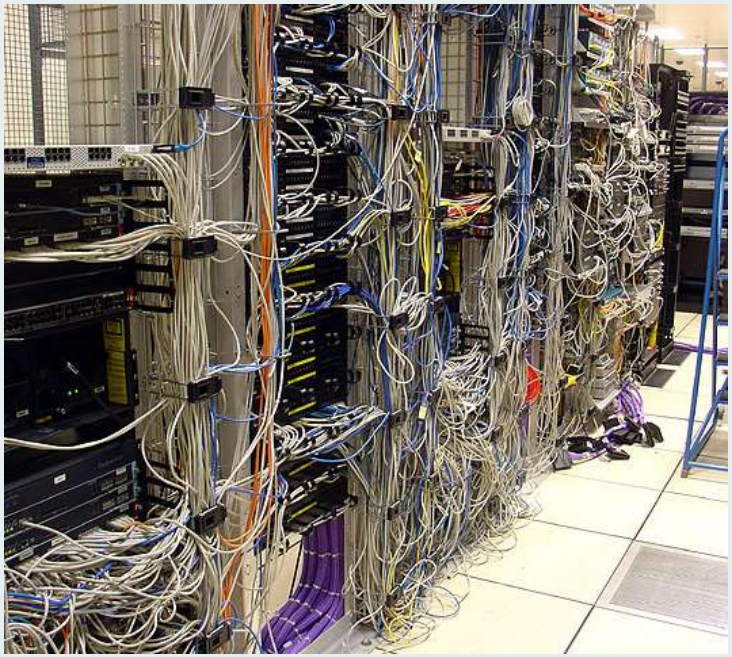


Data Science Campus

Example: Australia

Investing in technology and data infrastructure

- In 2015, the Australian Bureau of Statistics embarked on a comprehensive five-year, $250 million transformation project to modernize core statistical and enterprise assets
- Several interlinked data systems were created as a result including the Business Longitudinal Analysis Data Environment (BLADE)

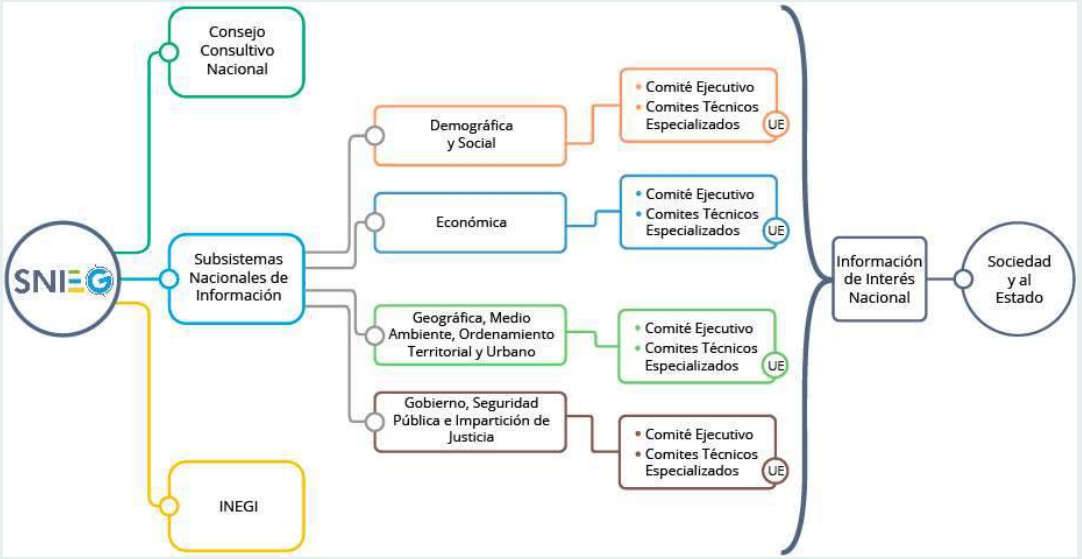


Example: Mexico

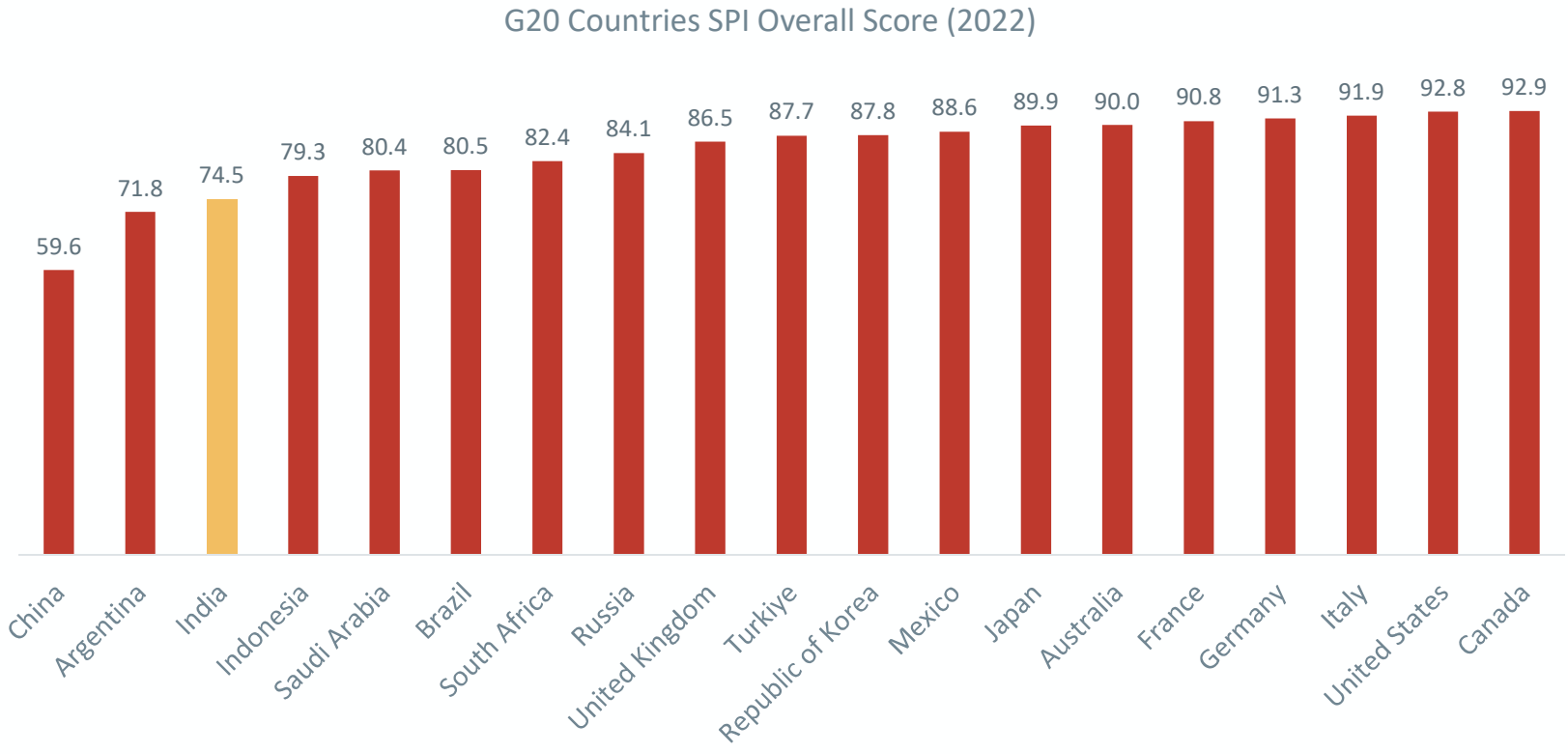
Strengthening statistical coordination and integration

- Mexico's National Institute of Statistics and Geography coordinates the decentralized federal statistical system as an autonomous public entity
- Federal-state coordination takes place through a network of committees and working groups.
- INEGI leverages system-wide strategies and work plans, and harmonized standards, methods and tools - including for the integration of statistical and geographic information

Coordination of the National System of Statistical and Geographic Information (SNIEG)



India's ambitious development agenda moves the goal post for statistical performance. Currently trailing its peers in the G20...



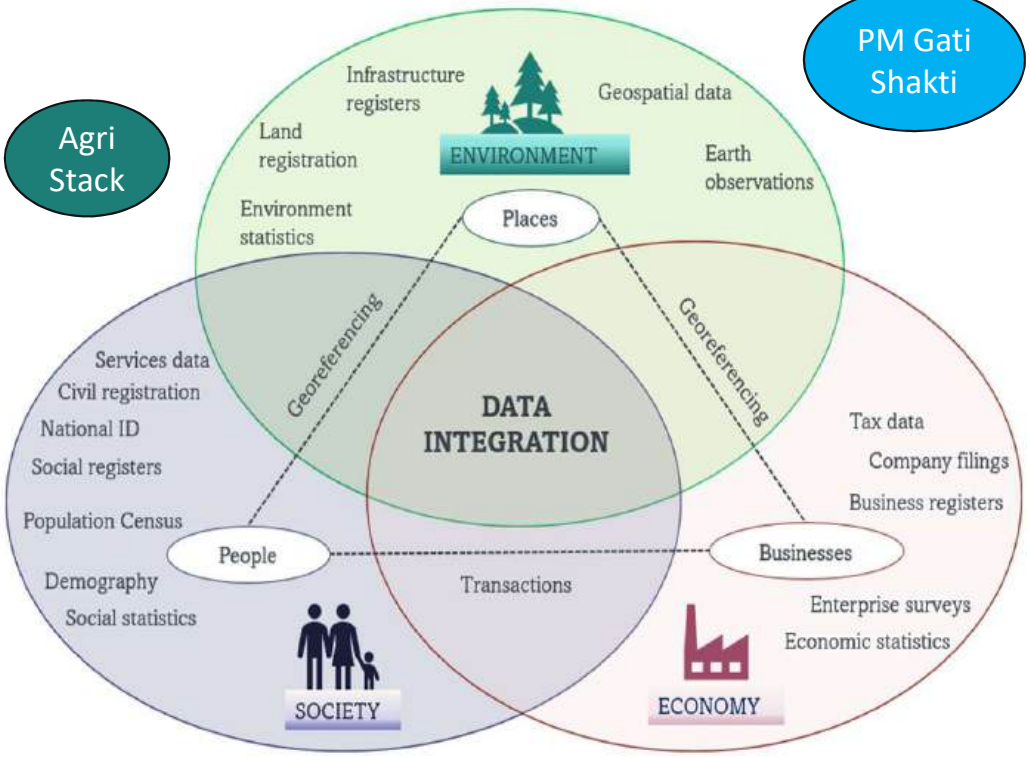
Source: https://www.worldbank.org/en/programs/statistical-performance-indicators

Integration of National Data and Statistical Systems is necessary to improve quality, timeliness and granularity of statistical information

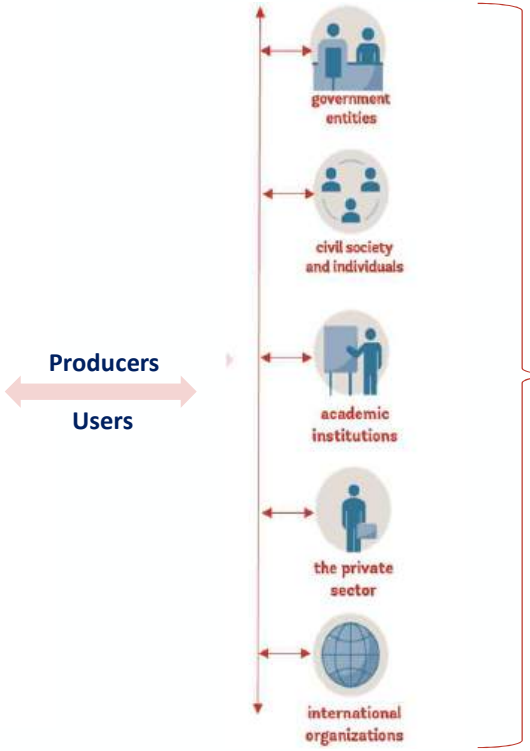
PM Gati Shakti

Agri Stack

India Stack



Source: UN Expert Group on Global Geospatial Information Management



Source: WDR 2021

Integrating the decentralized statistical system

Inclusive Governance Arrangements

Joint Statistical Programs

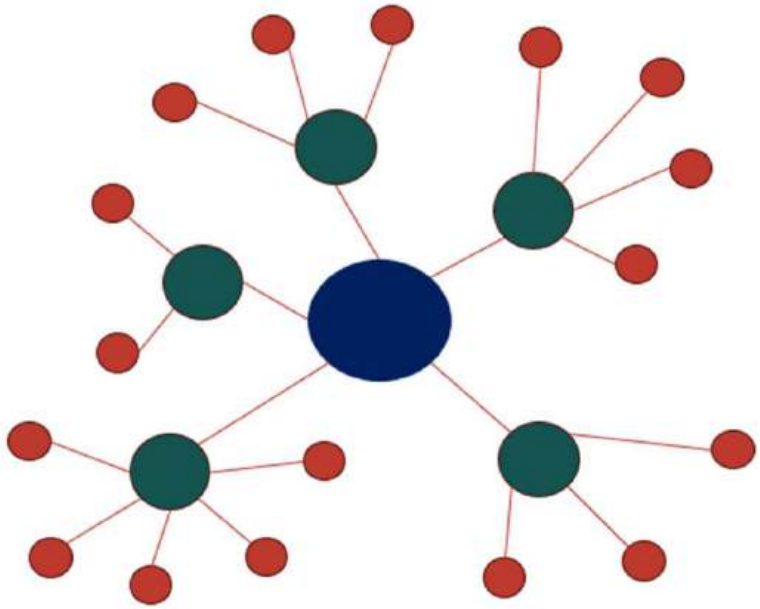
System-wide Capacity Building

Harmonized Standards & Definitions

Common Tools and Technology

Integrated Information Management

Leveraging key capabilities of the Center and States



A Roadmap to Integration

1. Develop a joint center-state framework for a revamped SSSP
2. Initiate sharing/cooperation on survey samples and instruments
3. Expand capacity building opportunities for states (training and technical assistance)
4. Initiate joint technology development & sharing (e.g., esankhyiki, eSigma)
5. Establish common data governance framework to unlock siloed data & promote data use and reuse
6. Undertake joint statistical projects, e.g.,

    - Leverage 8th EC to build SBR(s) for improved state & district-level growth monitoring

    - PLFS expansion for improved state and district-level employment data

    - Develop a joint framework for Natural Resource Accounting

    - Integrating, populating and disseminating common indicator frameworks SDGs, NIF/SIF/DIF, Aspirational Districts/Blocks, Good Governance etc.

Thank you

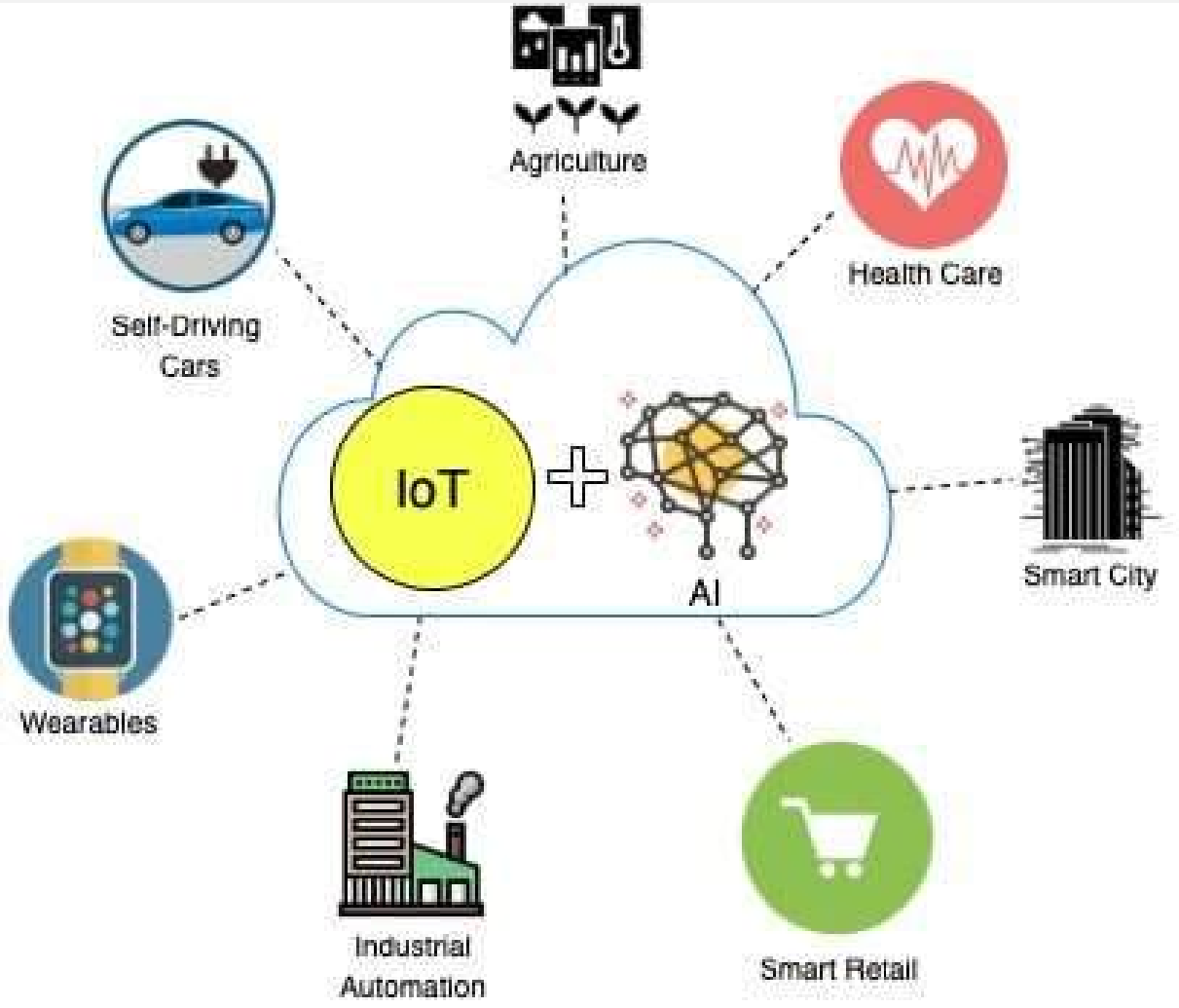
MACHINE LEARNING IN HEALTHCARE APPLICATIONS

Sanghamitra Bandyopadhyay

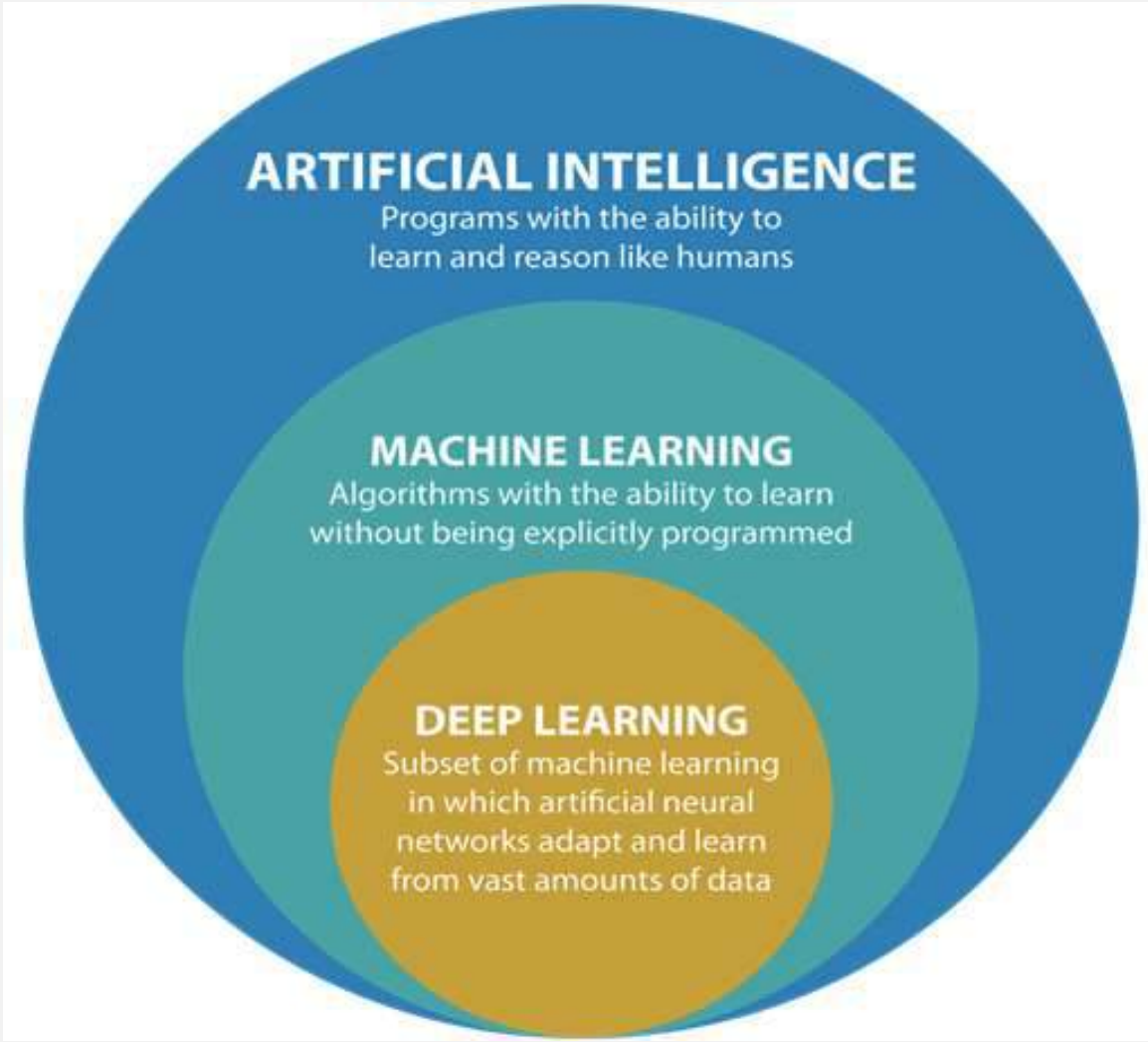
Indian Statistical Institute

Kolkata

AI, AI, Everywhere…



https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.iotworlds.com%2Fwhat-is-the-role-of-machine-learning-in-iot%2F&psig=AOvVaw0l6suiauA2SI9LY1mx7W11&ust=1640661066468000&source=images&cd=vfe&ved=0CAwQjhxqFwoTCPiRr4KBg_UCFQAAAAAdAAAAABAu



Ack: datacatchup – https://datacatchup.com/artificial-intelligence-machine-learning-and-deep-learning/

MACHINE LEARNING AND DEEP LEARNING WITH IRIS FLOWER DATA

Versicolor

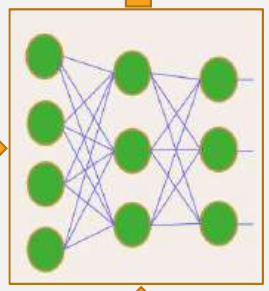
Virginica

Setosa

FEATURE EXTRACTION

Sepal Length	Sepal Width	Petal Length	Petal Width
7.0	3.2	4.7	1.4
6.3	3.3	6.0	2.5
5.1	3.5	1.4	0.2

TRAIN



Versicolor OR Virginica OR Setosa

TEST

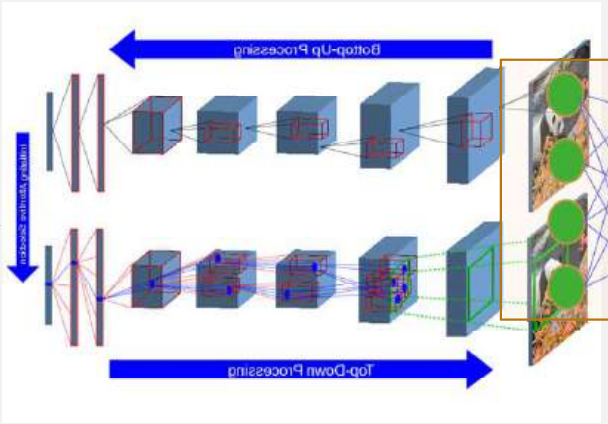
MACHINE LEARNING AND DEEP LEARNING WITH IRIS FLOWER DATA

Versicolor

Virginica

Setosa

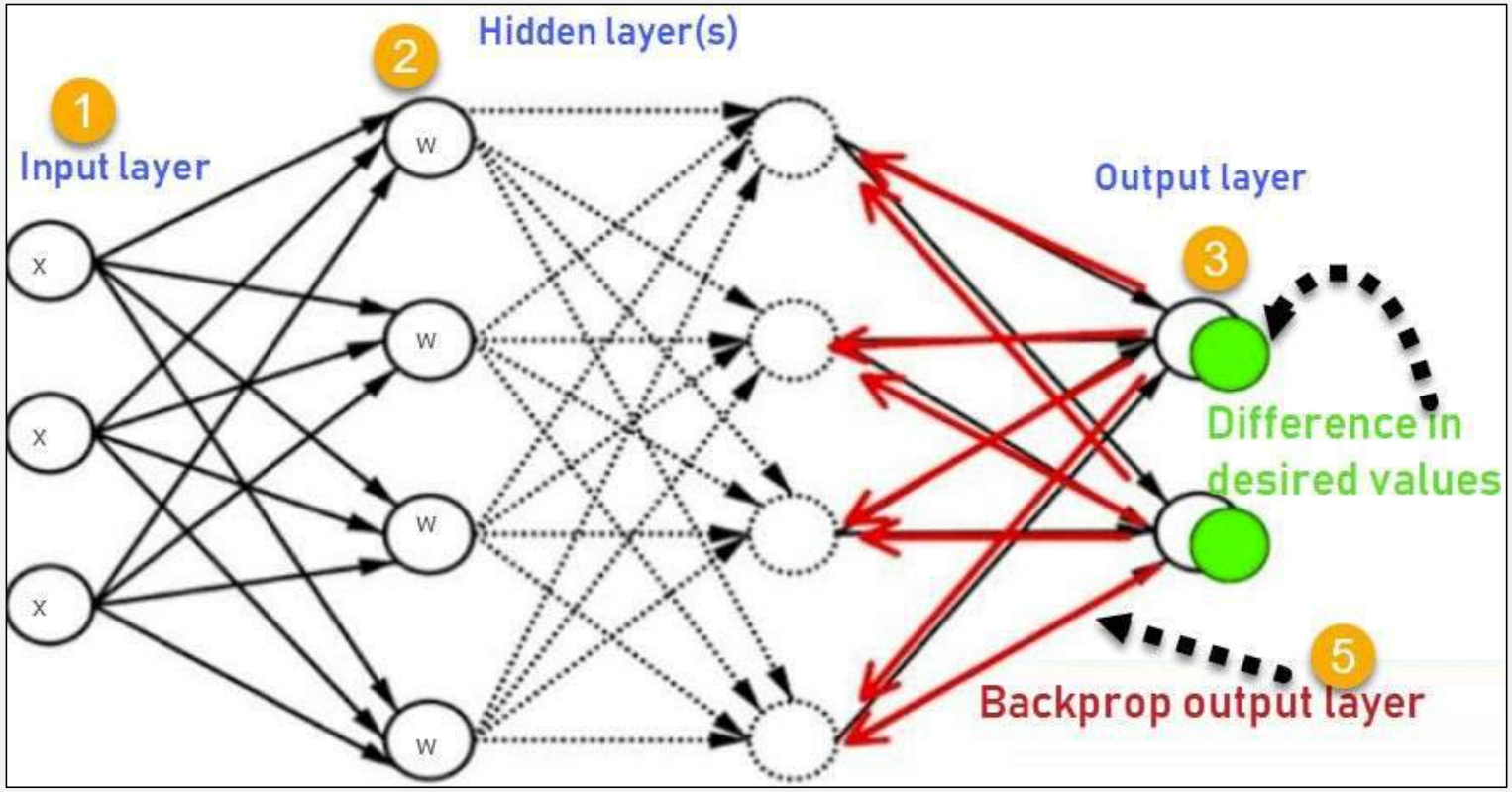
TRAIN



Versicolor OR Virginica OR Setosa

TEST

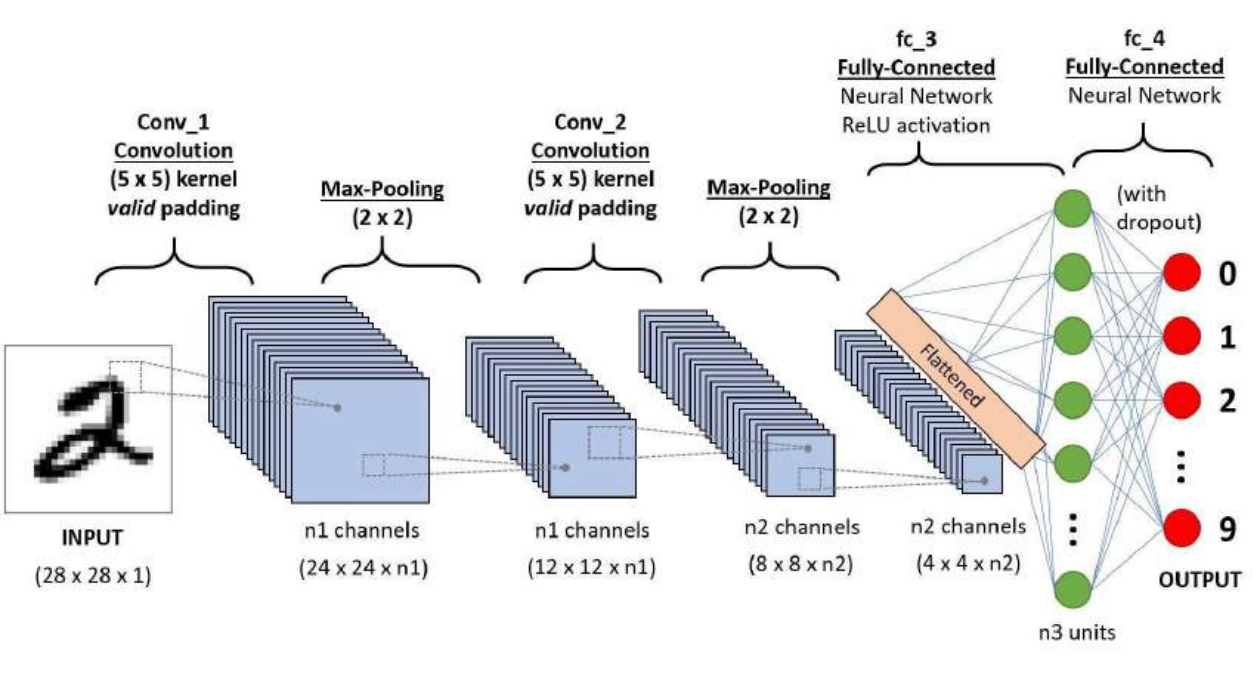
THE BASIC BLOCK
ARTIFICIAL NEURAL NETWORKS



The Back-Propagation Blues: A Deep Dive into the Workhorse of Neural Network Training | by udit ...itsudit.medium.com

DEEP LEARNING MODELS – CONVOLUTIONAL NEURAL NETWORKS (CNNS)

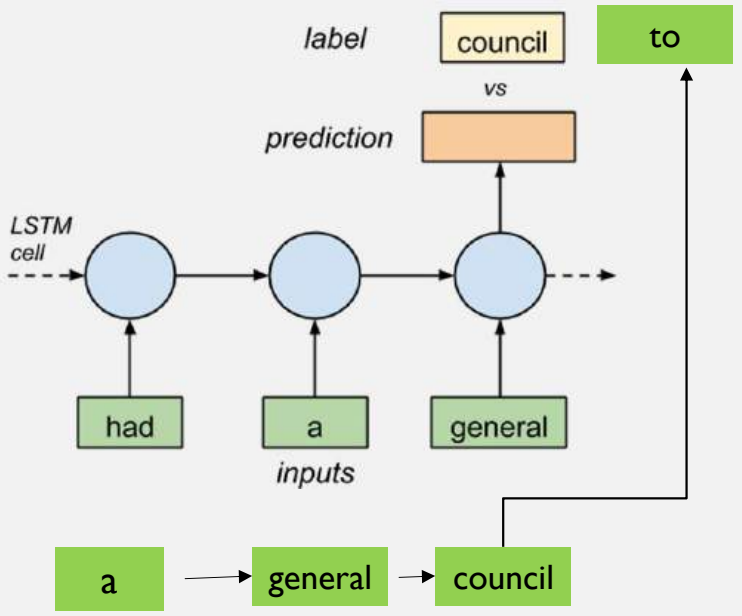
IMAGE RECOGNITION TASKS



DEEP LEARNING MODELS – LONG SHORT TERM MEMORY NETWORKS (LSTMS)

NATURAL LANGUAGE PROCESSING TASKS

Long ago, the mice had a general council to consider what measures they could take to outwit their common enemy, the cat. some said this, and some said that but at last a young mouse got up and said he had a proposal to make, which he thought would meet the case. you will all agree, said he, that our chief danger consists in the sly and treacherous manner in which the enemy approaches us. now, if we could receive some signal of her approach, we could easily escape from her. i venture, therefore, to propose that a small bell be procured, and attached by a ribbon round the neck of the cat. by this means we should always know when she was about, and could easily retire while she was in the neighbourhood. this proposal met with general applause, until an old mouse got up and said that is all very well, but who is to bell the cat? the mice looked at one another and nobody spoke. then the old mouse said it is easy to propose impossible remedies.

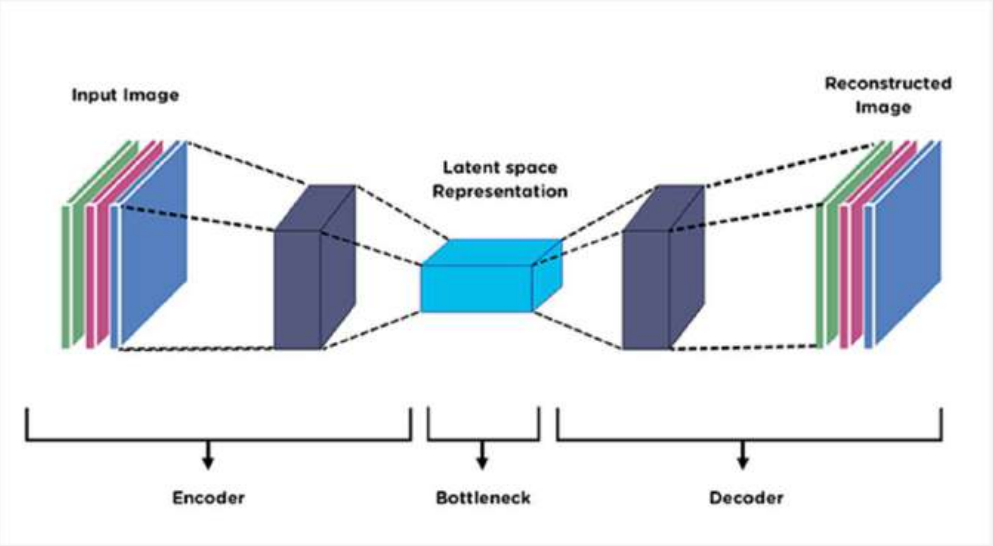


LSTM by Example using Tensorflow. In Deep Learning, Recurrent Neural… | by Rowel Atienza | Towards Data Science

DEEP LEARNING MODELS – AUTO ENCODERS

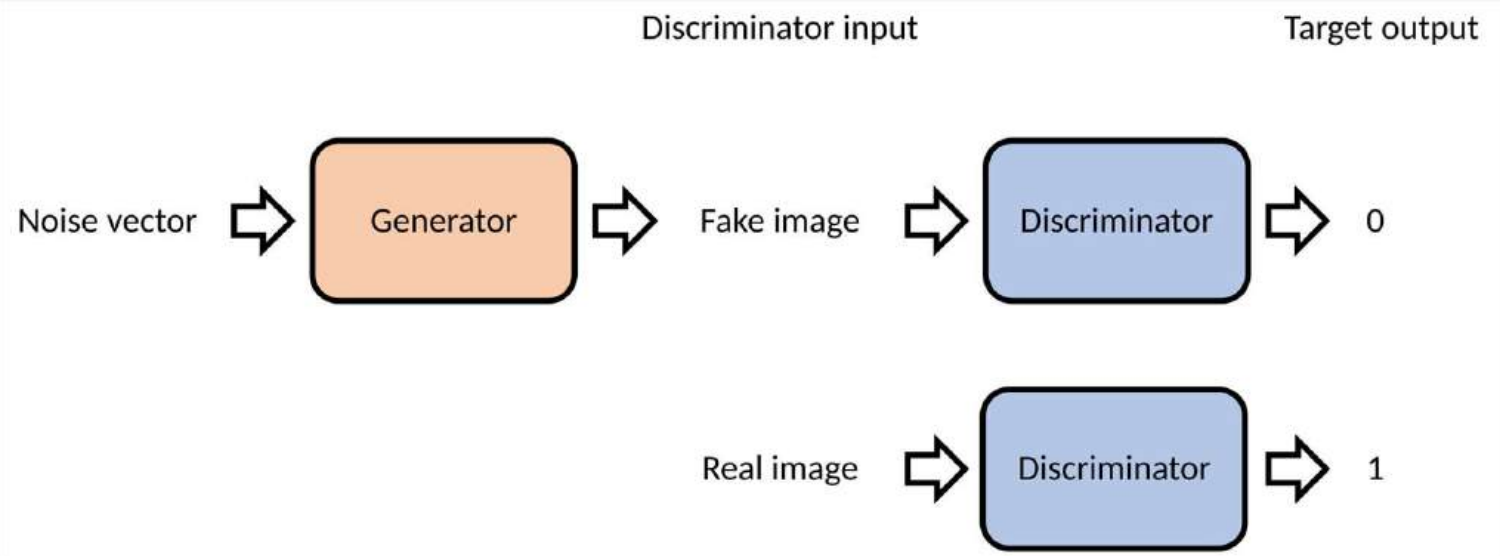
COMPRESSION TASKS

Autoencoders are a types of neural networks that are commonly used for unsupervised learning tasks such as dimensionality reduction, feature learning, and data compression.



DEEP LEARNING MODELS – GENERATIVE ADVERSARIAL NETWORK (GAN)

GENERATING NEW DATA SIMILAR TO REAL DATA



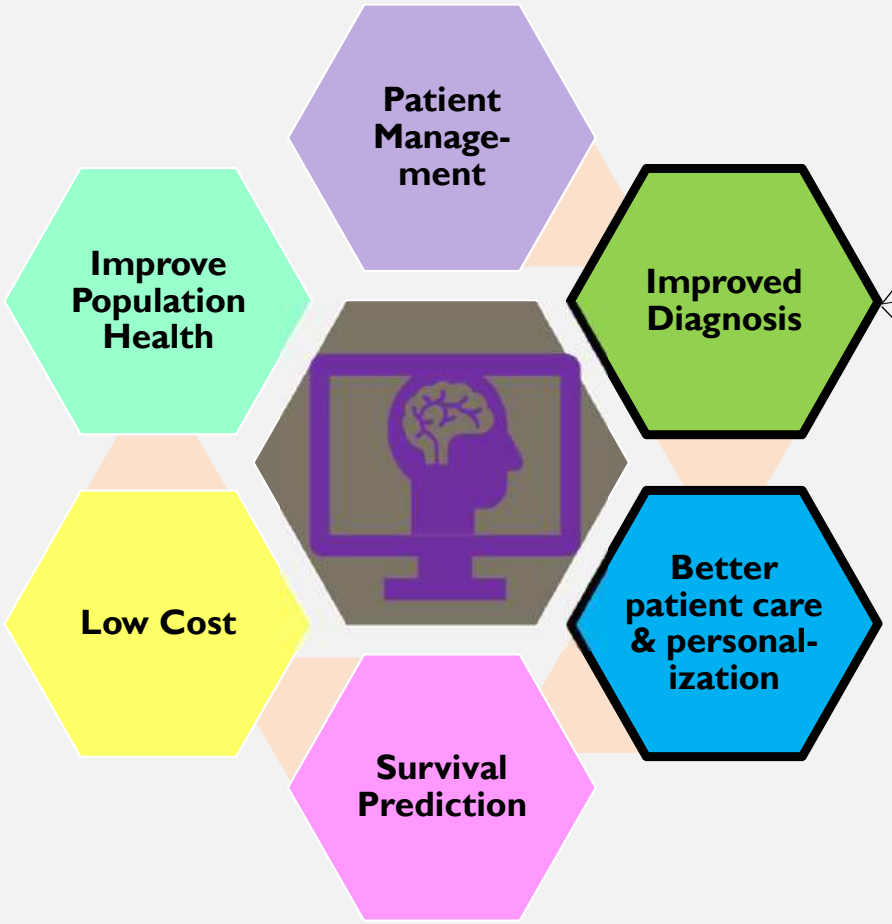
Discriminator Training: to output 0 when fake image is input, and output 1 when real image is input
Generator Training: to generate fake image such that Discriminator output is 1.

REVOLUTIONS IN LIFE SCIENCES RESEARCH

[MIT REPORT]

- Molecular and Cellular Biology
  - Discovery of the structure of DNA in 1953
  - Looking at molecules inside the cells
- Genomics
  - Looking at the entire genome
  - understanding the genetic basis of diseases
- Multimodal data
  - Genomic, proteomic, expression, images, clinical
- **Convergence**
  - Life sciences and physical sciences with
  - Engineering, technology, IoT, mathematics

AI AND ML IN HEALTHCARE



Genetic marker detection in Breast and colon cancer

Elucidating the role of microRNAs in Alzheimers

Understanding the Genetic basis of diseases.

AI AND ML IN HEALTHCARE

- According to WHO, 10 million more health workers will be needed by 2030 – there will be shortage
- Can be partially mitigated by AL/ML-based technologies
  - improve efficiency of care delivery, free health professionals' time for a more personalized approach to each patient.

- **37.5%** - CAGR of the global AI/ML in healthcare market from 2023-2030 (Grand View Research)
- expected AI in healthcare market size will be **$102.7 bn** by 2028 (Research and Markets)
- **17%** more time physicians can dedicate to patients due to AI implementation (Statista)

Machine Learning In Healthcare: 10 Use Cases, Examples & Benefits (itransition.com)

AI AND ML IN HEALTHCARE
PREDICTIVE ANALYTICS

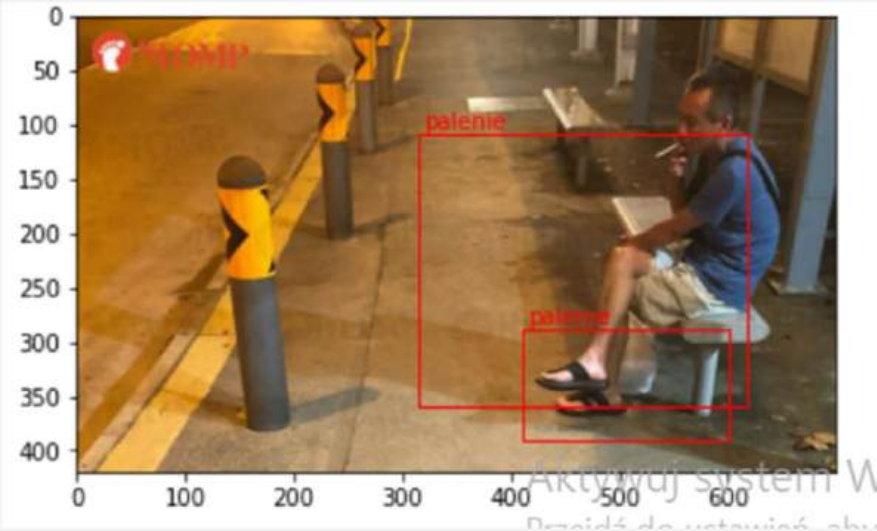
- Predictive analytics tools can aggregate satellite, weather and other data to forecast potential disease outbreaks.
  - Predicting malaria outbreaks by analyzing monthly rainfall, temperature, humidity and similar parameters.
  - Knowing about critical outbreaks upfront, governments can take precautions to minimize the negative impact and save lives.

- ProMED (the Program for Monitoring Emerging Diseases) - International Society for Infectious Diseases
  - Reports possible outbreaks of infectious diseases worldwide
  - Exposure to toxins affecting human or animal health
  - Aggregates data from official releases, media, and subscriber reports
  - Expert team reviews these reports before they are accepted into the system
  - Data aggregated in a HealthMap to visualize disease outbreaks in every country

Machine Learning In Healthcare: 10 Use Cases, Examples & Benefits (itransition.com) 2024

AI AND ML IN HEALTHCARE
BEHAVIOR ALTERATION

- Many prevalent diseases are manageable through life style changes
  - type 2 diabetes, obesity, and heart diseases if detected early
- Adopting healthy lifestyle → modification of behavior
  - not easy → constant reminders and follow-ups
- Data from devices and sensors + ML algorithms
  - prods and guides users
- SmokeBeat – An app
  - smoking cessation app that gathers data on the user's smoking behavior
  - accelerometer on a smartwatch
  - smart band to detect hand-to-mouth gestures.
  - processes the data, offers real-time cognitive behavior therapy incentives
  - compares users' smoking data with their peers of choice, creating supportive social network.



Machine Learning In Healthcare: 10 Use Cases, Examples & Benefits (itransition.com) 2024

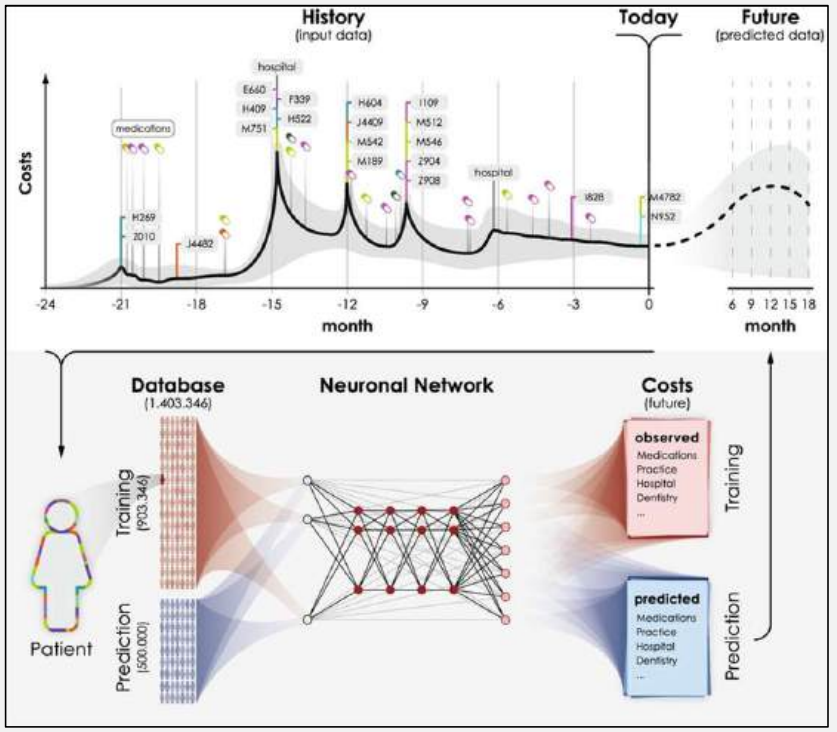
AI AND ML IN HEALTHCARE
HOSPITAL MANAGEMENT

- Administrative data processing, facilitate hospitals' executive functions
  - staff scheduling, supply chain & inventory management, resource allocation, medical records management
- Globus.ai (a Norway based company) use NLP and ML for
  - Task scheduling – match healthcare employees to specific tasks based on their skill sets ensuring
  - legal working hours and other requirements
  - other legal compliances like presence of particular expertise during certain procedures

Machine Learning In Healthcare: 10 Use Cases, Examples & Benefits (itransition.com) 2024
Informaticsnurse.com

AI AND ML IN HEALTHCARE
HEALTH INSURANCE AND COSTS

- Health insurance uses mostly manual-based processes
- Machine learning can be used for
  - credit underwriting, risk assessment, claims to process and customer support.
- ML algorithms is used in early fraud detection.
  - Rule-based systems flag too many claims as potentially fraudulent
  - ML systems learn to gradually decrease the probability of false positives
- Temple University Health System (TUHS) system utilizes ML
  - to analyze medical claims, lab results, and other patient information
  - to offer tailored healthcare plans to patients
  - TUHS has saved > $2 million in claim costs, and
  - achieved a 50% increase in employee engagement



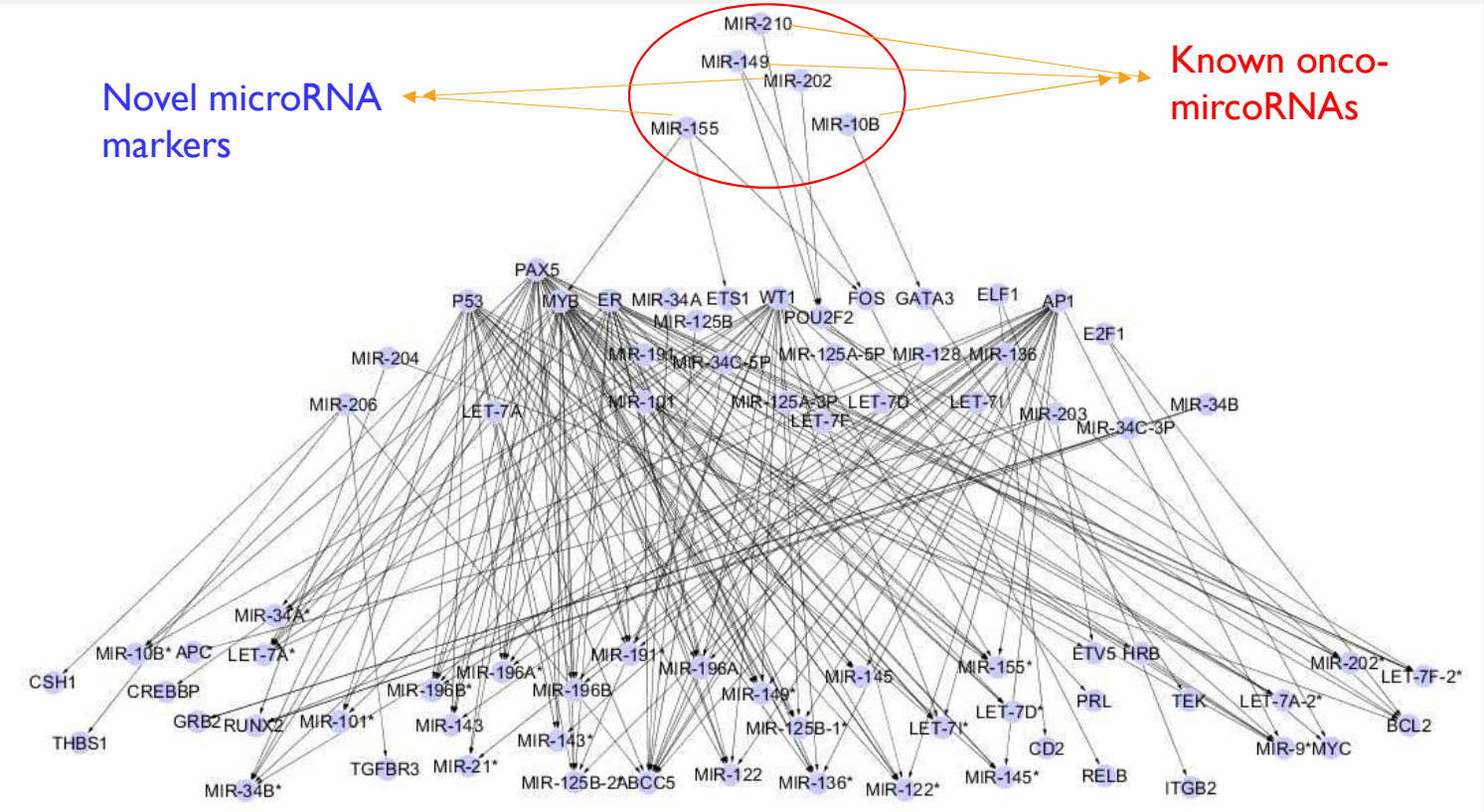
Predicting future health care cost from claim records

Machine Learning In Healthcare: 10 Use Cases, Examples & Benefits (itransition.com) 2024
Drewe, et al (2022). Deep learning for prediction of population health costs. *BMC Med. Infor. & Dec. Making*

AI AND ML IN HEALTHCARE
PATIENT MANAGEMENT

- Electronic Health Records - Digitally stored patients health record
  - EHR integrated with AI based voice/speech recognition
  - improves doctor – patient interaction and reduces error
  - Automatic note taking, populating EHR, voice based retrieval
- Virtual Assistants
  - Appointment scheduling, personalized nursing assistance, automated discharge
- Predicting hospital stay duration

SOME CONTRIBUTIONS FROM MY GROUP
ANALYZING THE BREAST CANCER SPECIFIC NETWORK



SOME CONTRIBUTIONS FROM MY GROUP

LEAD MOLECULE DESIGN FOR MYCOBACTERIUM TUBERCULOSIS

RecA protein of M.TB complexed with DNA

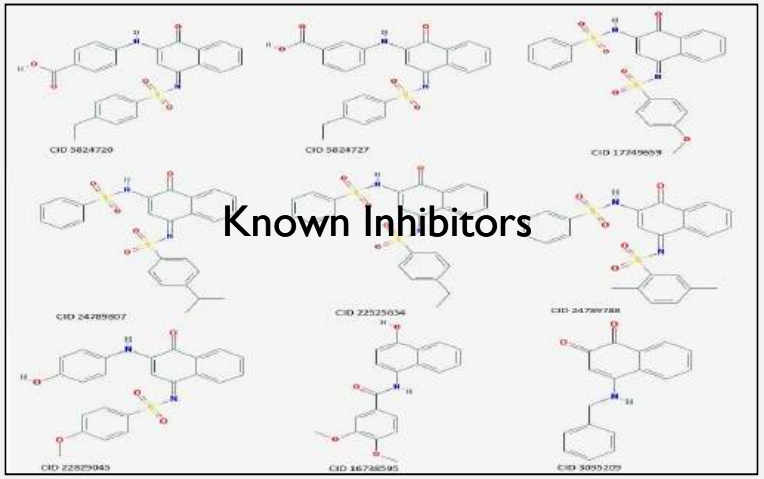
RecA repairs the bacterial DNA damaged by antibiotics

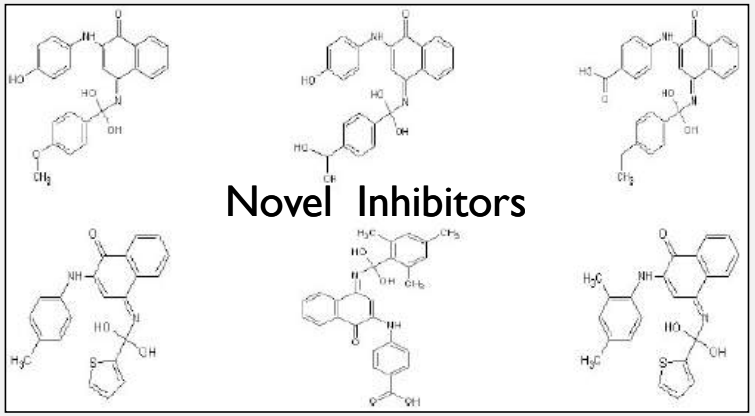
https://upload.wikimedia.org/wikipedia/commons/3/38/Homologous_recombination_3cmt.png

Use of Multiobjective Optimization Technique

Genetic Algorithms (NSGA-II)

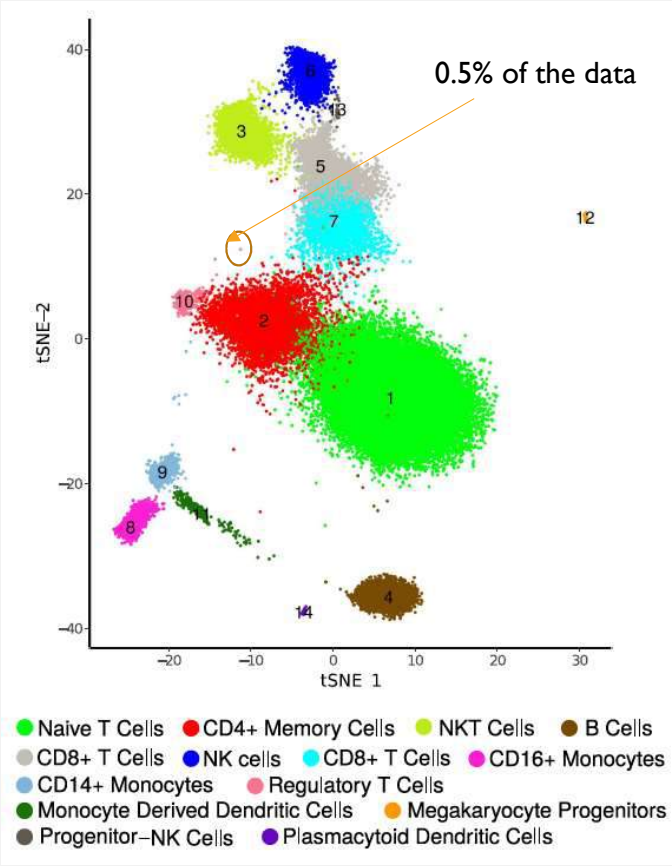
Simulated Annealing (AMOSA)





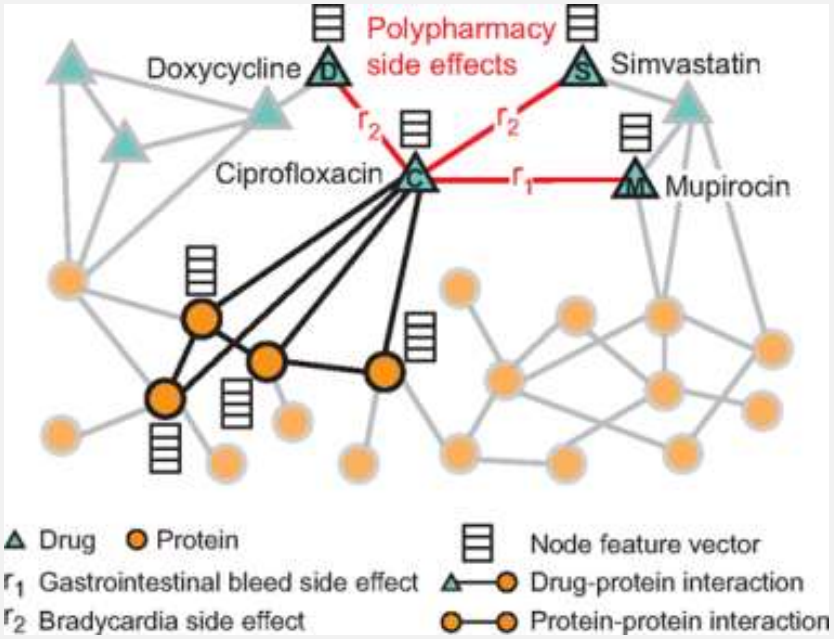
SOME CONTRIBUTIONS FROM MY GROUP
CLUSTERING ALGORITHM WITH SAMPLING

- dropClust and dropClust2
  - Clustering large, high dimensional single cell RNA-seq data
  - Structure preserving sampling
  - Innovative mode based PCA
  - Algorithm preserves small clusters
- Peripheral Blood Mononuclear Cells (PBMC)
  - 2700 cells x 32738 genes
  - Freely available from 10X Genomics
- [dropClust Online (shinyapps.io)]



https://upload.wikimedia.org/wikipedia/commons/3/38/Homologous_recombination_3cmt.png

SOME CONTRIBUTIONS FROM MY GROUP
DRUG-DRUG INTERACTION PREDICTION



- To predict side effects of two drugs in combination
- Heterogeneous graphs: Drugs and Proteins
  - drug-to-drug
  - drug-to-protein
  - protein-to-protein (PPIN)
- Drugs when applied together may have multiple side effects
- Graph neural networks are used for predicting side effects
- Task is to assign new medicine to a person
  - considering other diseases and ongoing medicines
  - so that no/minimal side effect occurs

AI: CHALLENGES AND FUTURE

- Minimal human intervention and high dependency on machine might be risky
  - Models hallucinate – give wrong output with high confidence
  - Wrong medical diagnosis, Wrong prediction ….
    - Recently Deep Learning tools made many mistakes…
    - Lack of good training data may bias the learning process
      - Taxi Drivers are mostly man
      - Nurses are mostly women
  - Explainable and Trusted AI is becoming more important.
    - Not only the output but also the explanation and trust

CALLS FOR CAUTION

- Feb 2023: A New York Times technology columnist reported that he was “deeply unsettled” after a chatbot that’s part of Microsoft’s upgraded Bing search engine repeatedly urged him in a conversation to leave his wife.
- May 2023 [Tamlyn Hunt]: “Artificial intelligence algorithms will soon reach a point of rapid self-improvement that threatens our ability to control them and poses great potential risk to humanity”
- Spread of disinformation for creating social tensions when in the wrong hands
- Influencing voters thus posing a grave threat to democracy
- Manipulation of the human brain
- In March 2023, an open letter - co-signed by dozens of people in the AI field, including the tech billionaire Elon Musk and Yoshua Bengio –
  - called for a pause on all developments more advanced than the current version of AI chatbot ChatGPT so robust safety measures could be designed and implemented.

CALLS FOR CAUTION

- BBC, May 2023
  - Geoffrey Hinton, 75, told the BBC some of the dangers of AI chatbots were "quite scary".
    - "Right now, they're not more intelligent than us, as far as I can tell. But I think they soon may be."
  - Yoshua Bengio
    - We need to take a step back
- Issues of trust, privacy, transparency, accountability and ethics
- Rise of AGI - artificial general intelligence
  - Make no mistake, we are on a speeding train right now, and the concern is that one day it will start building its own tracks. [BBC, 2023]


नमस्कार


ThankYou!!

Internal Quality Assessment Framework (IQAF)

Plenary Session-II

CoCSSO, 13th August, 2024

State Unit
Ministry of Statistics and Programme Implementation
Government of India

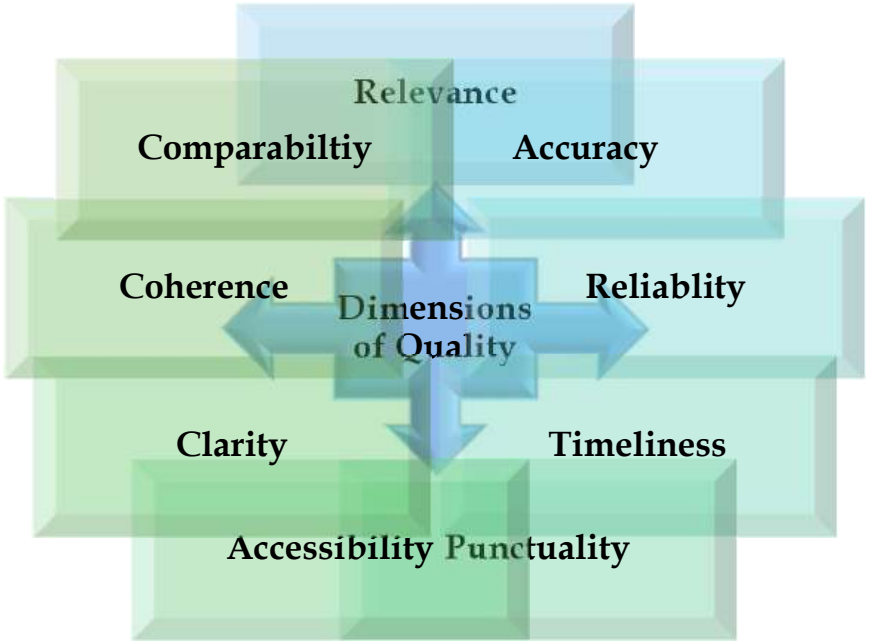
Understanding Quality

Definition of Quality

"Fit for use" or “Fit for purpose” is a widely accepted definition for measuring quality of statistical products or processes.

Significance of Quality

Statistical data Quality directly impacts effectiveness of design and implementation of socio-economic developmental programmes by government and non-government agencies.



Quality culture for Official Statistics

- Shared values, beliefs, behaviours, and practices related to quality assurance within a statistical agency that shape and characterize work environment and individual workplace.

- shared commitment focused on user needs
- continuously striving for improvement and innovation
- ensuring confidence of users into official statistics.

Focus of Quality Assurance Frameworks

Maintaining a culture of quality, Tool of Statistical Quality Management

Set standards of Quality

Systematic monitoring and identification of quality issues for improvement

Greater transparency to the processes and Building Public trust in Quality

UN NQAF

- United Nations Statistical Commission, in March 2019, adopted National Quality Assessment Framework (NQAF) Manual for Official Statistics.
- Aims at assuring the quality of official statistics throughout the National Statistical System (NSS)
- Provides guidance for developing and implementing a Quality Assurance Framework for countries.
- Provides guidance for the engagement with statistics producers and data providers that are outside of the NSS
- Countries may customize their own national quality assurance frameworks.

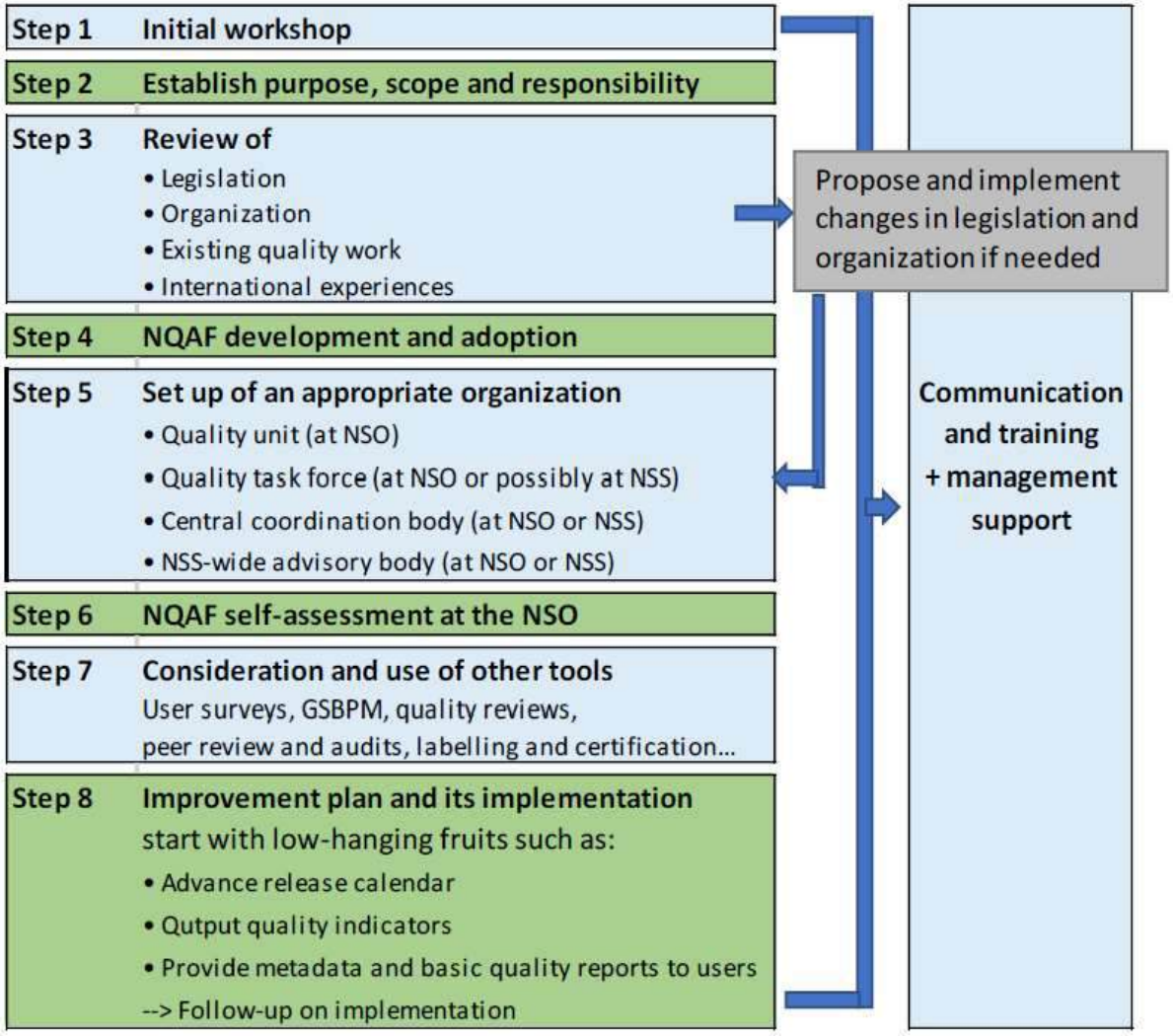
UN NQAF quality principles and supporting Fundamental Principles of Official Statistics (FPOS)

Quality principles	Fundamental Principles of Official Statistics									
	1	2	3	4	5	6	7	8	9	10
Level A: Managing the statistical system										
1: Coordinating the national statistical system								✸		
2: Managing relationships with data users, data providers and other stakeholders	✸				✸			○		○
3: Managing statistical standards									✸	
Level B: Managing the institutional environment										
4: Assuring professional independence	○	✸					○			
5: Assuring impartiality and objectivity	✸	○	○	○	○		○			
6: Assuring transparency			✸				○			
7: Assuring statistical confidentiality and data security						✸				
8: Assuring commitment to quality		✸								
9: Assuring adequacy of resources	○									
Level C: Managing statistical processes										
10: Assuring methodological soundness		✸			○				○	○
11: Assuring cost-effectiveness					✸				○	
12: Assuring appropriate statistical procedures		✸			○					
13: Managing the respondent burden					✸					
Level D: Managing statistical outputs										
14: Assuring relevance	✸		○		○					
15: Assuring accuracy and reliability	✸				○					
16: Assuring timeliness and punctuality	✸				○					
17: Assuring accessibility and clarity	✸		○							
18: Assuring coherence and comparability	✸		○						○	
19: Managing metadata			✸						○	

✸ Fundamental Principles of Official Statistics (usually one) providing very strong support

○ Additional supporting Fundamental Principles of Official Statistics (subject to different views)

Figure 1. Roadmap for the establishment and implementation of an NQAF



Steps taken by MoSPI

Task Force set up.

- To customize UN-NQAF 2019 in Indian context.

Task Force recommended Customized QAF

Internal Quality Assessment Framework (IQAF) circulated for pilot self - assessment

5 MoSPI products: ASI, CPI, IIP, GDP and PLFS

Steering Committee on IQAF constituted

To deliberate upon technical issues faced during pilot

IQAF revised on the basis of feedback of pilot assessment

19 Principles, 85 Requirements and 340 elements

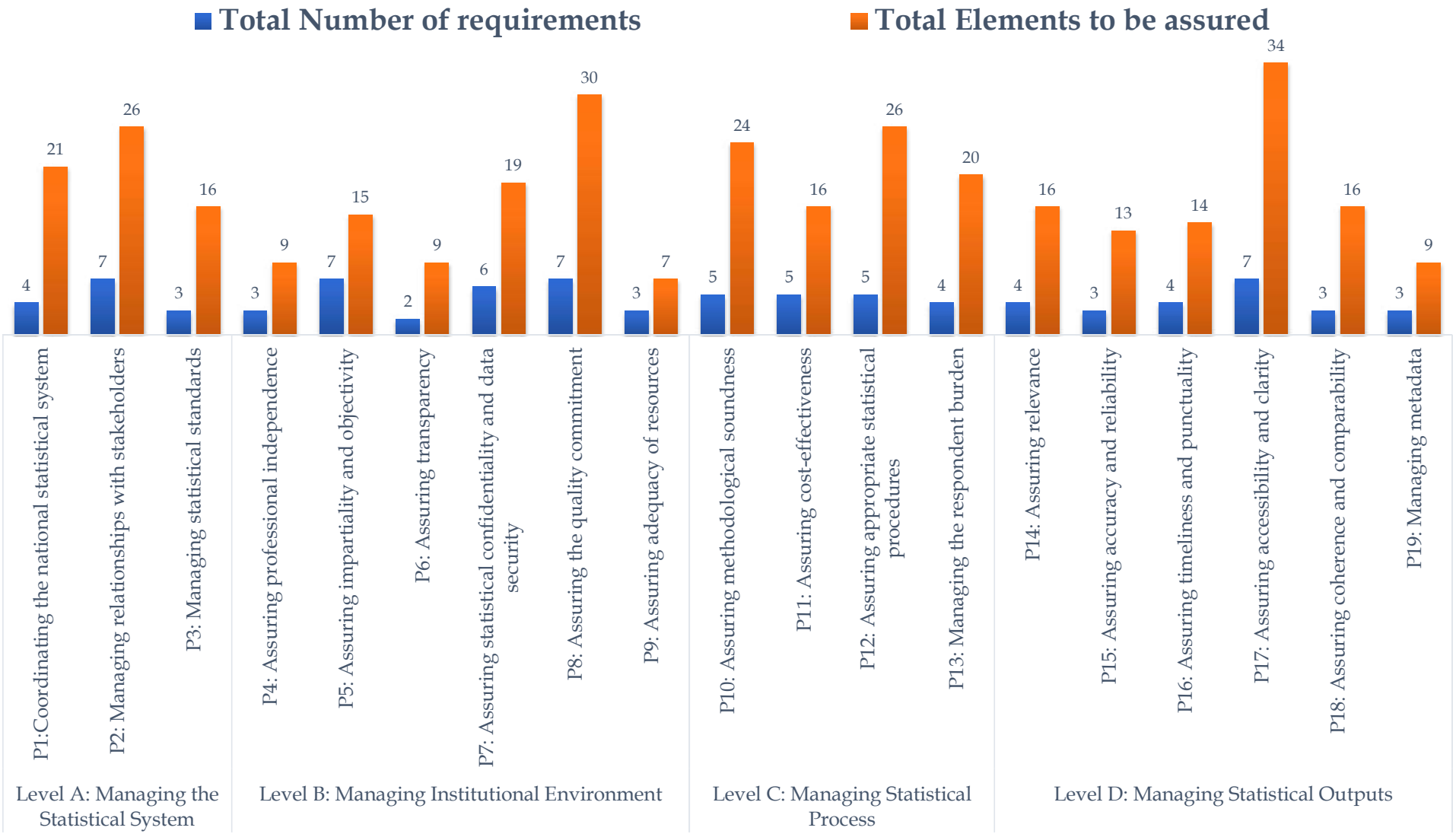
Baseline/Self Assessment underway

Gaps to be identified

Targets to be set up for improving processes and initiating measures to bridge gap and improve quality scores.

Structure of MoSPI's IQAF

Elements under Requirements 8.8 (*Risk analyses)* and 11.1 (*cost-effectiveness of statistical activities*) of UN NQAF were recommended to be dropped in IQAF.


Total Number of requirements
Total Elements to be assured
4
21
7
26
3
16
3
9
7
15
2
9
6
19
7
30
3
7
5
24
5
16
5
26
4
20
4
16
3
13
4
14
7
34
3
16
3
9
P1:Coordinating the national statistical system
P2: Managing relationships with stakeholders
P3: Managing statistical standards
P4: Assuring professional independence
P5: Assuring impartiality and objectivity
P6: Assuring transparency
P7: Assuring statistical confidentiality and data security
P8: Assuring the quality commitment
P9: Assuring adequacy of resources
P10: Assuring methodological soundness
P11: Assuring cost-effectiveness
P12: Assuring appropriate statistical procedures
P13: Managing the respondent burden
P14: Assuring relevance
P15: Assuring accuracy and reliability
P16: Assuring timeliness and punctuality
P17: Assuring accessibility and clarity
P18: Assuring coherence and comparability
P19: Managing metadata
Level A: Managing the Statistical System
Level B: Managing Institutional Environment
Level C: Managing Statistical Process
Level D: Managing Statistical Outputs

Assessment Criteria

Element

- Compliance with a requirement depends on the compliance with the elements.
- Assessment would take place at element level.
- Categorized as “Full compliance” (1) or "Partial compliance" (0.5) or as “No compliance” (0).

Requirement

- Score for a requirement is simple average of scores given to its elements
- Score would be expressed as number between 0 and 1

Principle

- Score for a principle is the average of the scores of the underlying requirements multiplied by 100.

Overall Score

- Average of the individual scores of principles expressed as number between 0 and 100.

Way Forward

- MoSPI aims to create awareness amongst members of the National Statistical System to impress upon significance of Quality Culture.

- MoSPI aims to guide Statistical organizations of the country to use, assess and improve their statistical processes, product and institutional environment.

- IQAF Manual is proposed to be circulated to central Ministries/Departments and State/UT for sensitization and self-assessment. Feedback/comments received from them may be considered for updating the IQAF Manual.

- At least 2 each volunteer Ministries and States are invited to initiate the IQAF adoption.

Thank You!

New Initiatives
Infrastructure and Project Monitoring

Infrastructure and Project Monitoring Division
Ministry of Statistics and Programme Implementation

Conference of Central & State Statistical Organization
Dated 13.08.2024 (Tuesday)

IPMD Mandate

As per Allocation of Business Rules, 1961(as Amended up to 03/04/2024)

- Monitoring of projects of Rs.150 crores and above.
- Monitoring of the performance of Infrastructure Sectors.

Project Monitoring

Project Monitoring
(*Existing Framework)*

- Monitoring of Central Sector projects of Rs.150 crores & above
- Monitoring via Online Computerized Monitoring System (OCMS) web application
- **Parameters/data points**

  Schedule related
  Board Approval Date, Original/ Revised/Anticipated Completion Dates, Physical Progress

  Finance related
  Original/Revised Project Cost, Budget Estimate, Expenditure incurred

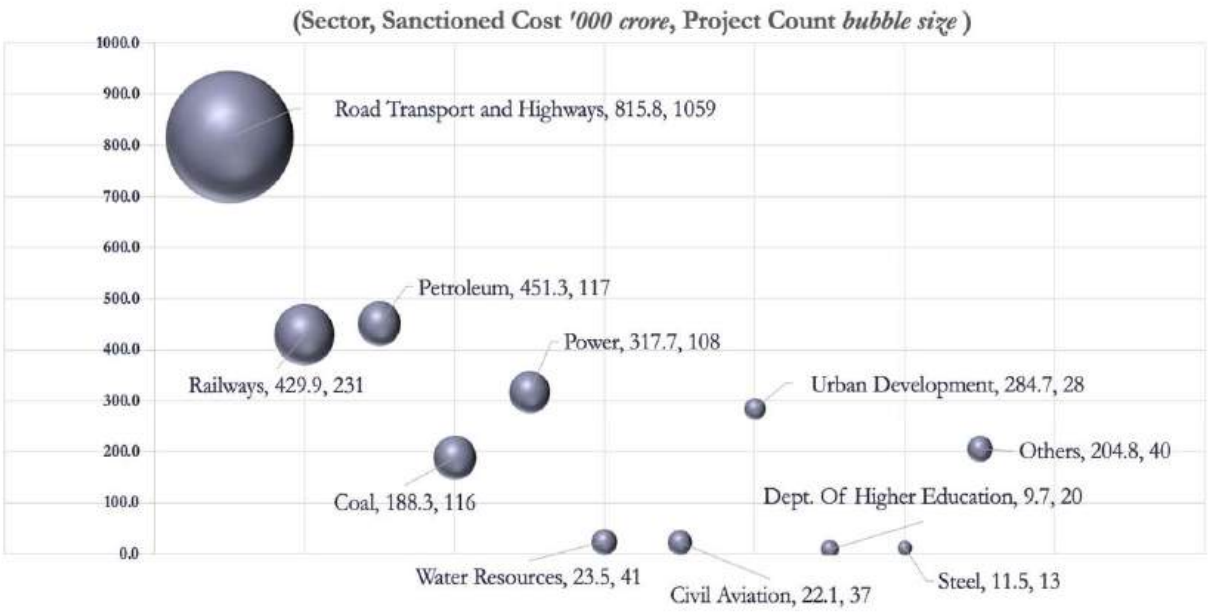
  Issues in Project Execution & Reasons for Cost/Time Overrun

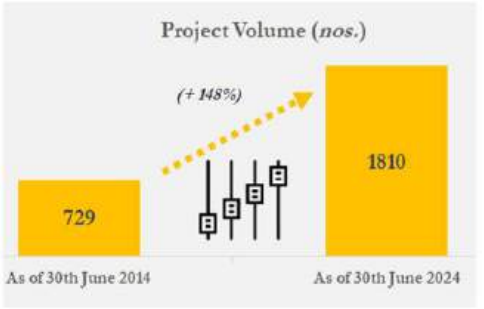
- Periodic Reports (Monthly & Quarterly) at *www.cspm.gov.in*

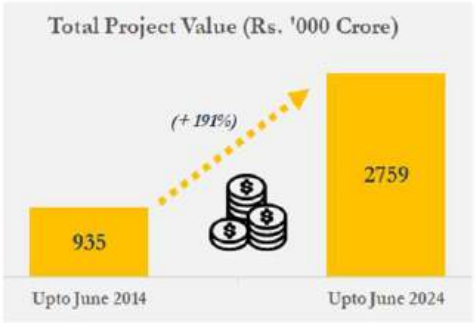
Project Monitoring-Overview as of June 2024

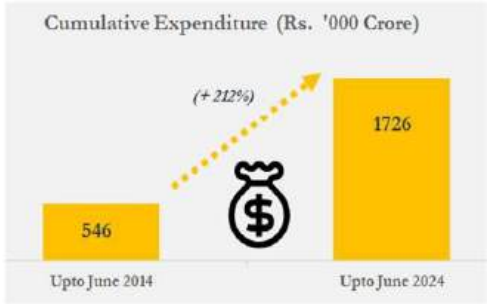
(Existing Framework)

(20+ Sectors, **1810** Projects with **Total Project Value** Rs. 27.59 Lakh Crore)





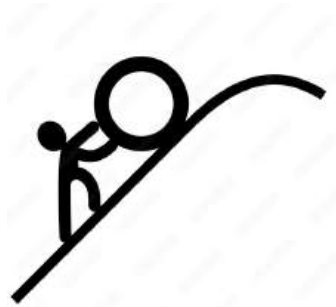




Project Monitoring

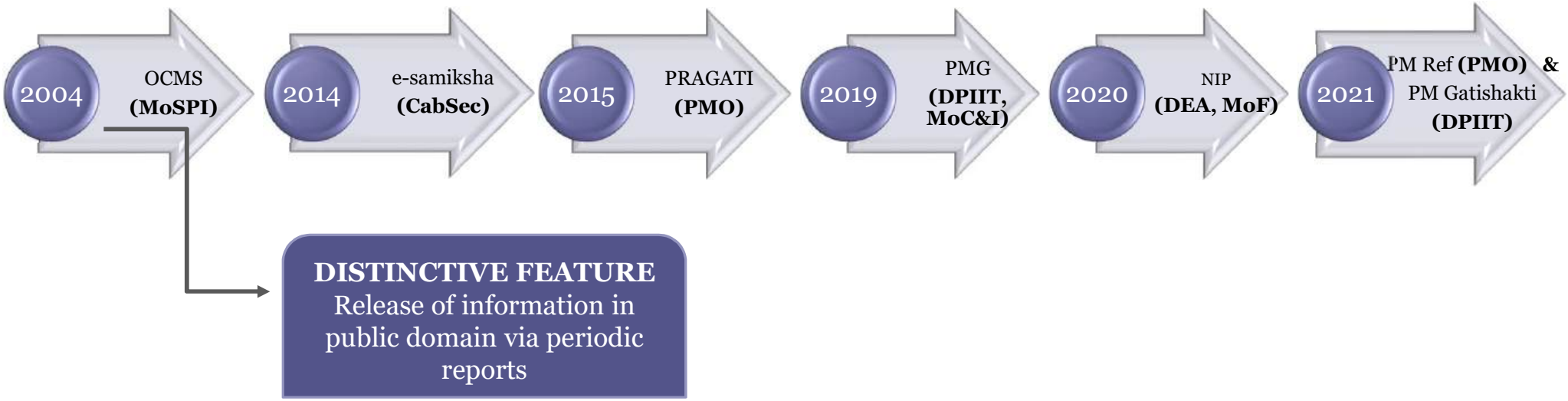
Challenges

Varied GoI Monitoring Platforms emerged with time



"multiple portals have led to an increase in reporting burden on Ministries/Departments"

"various inconsistencies in the data reported on these portals, no single source of truth exist"

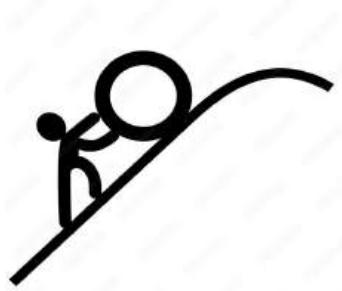


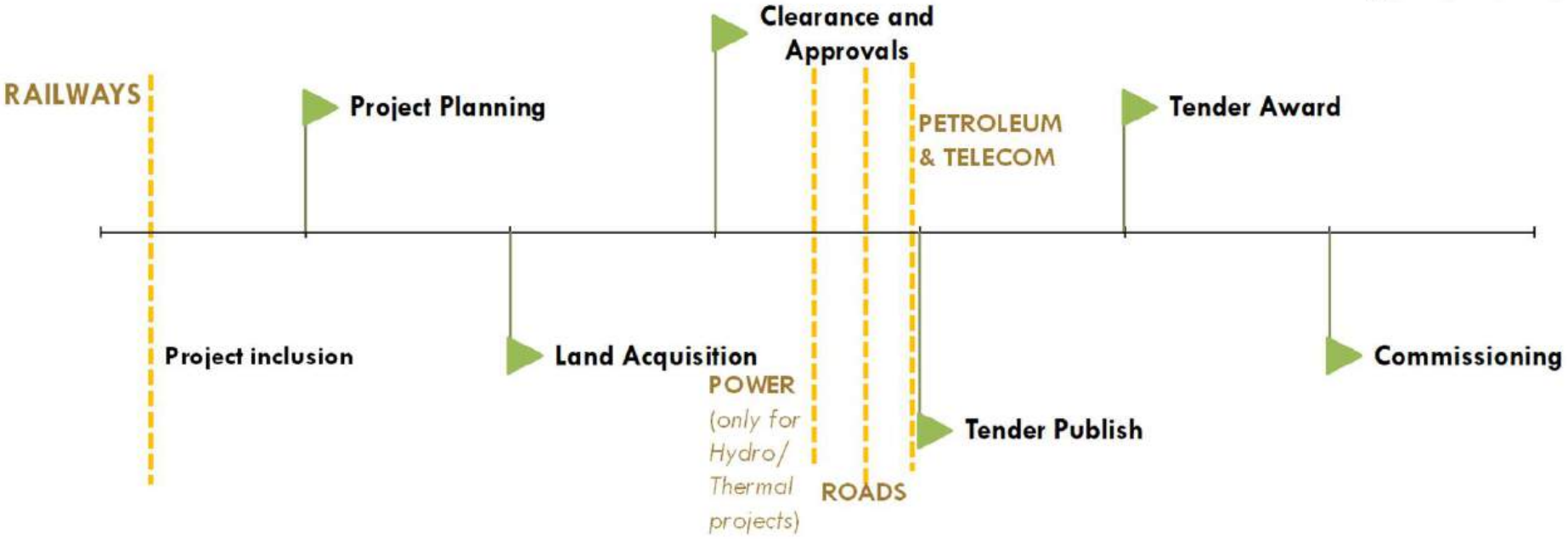
Project Monitoring

Challenges

lack of standardization in key metrics across LMs/Deptts/ Monitoring entities

Project Life cycle & Zero date (an indicative diagram: cross-sector variation)





Project Monitoring

Way ahead (1) - Integration of IIG-PMG with OCMS

Following the principle of ***"one data-one entry",***

- ✓ **Integrated IIG-PMG portal** (IIG-DEA & PMG-DPIIT) made live in **2023.**
- ✓ **Integration of OCMS portal with IIG-PMG** – in pipeline, expected to go-live by **December 2024**

  - *Post-integration, data would be fetched from integrated IIG-PMG-OCMS to New MoSPI's platform via APIs*
  - *Dashboard and Reports to be generated from New MoSPI's platform*

Project Monitoring

Way ahead (2) – A manual to standardize the key metrics of Project monitoring across all LMs/ Deptts/ Monitoring entities.

- Formulated a manual proposing a robust approach for the standardization of key metrics namely ***Time Overrun & Cost Overrun*** **at** ***Pre-construction & Construction stage.***

- ***To be shared soon*** *with concerned Line Ministries/ Departments/ Monitoring entities*

- **Objective:**

  - ✓ *Standardization of marking* ***Project Start Date (or Zero Date)*** *across LM/ D, leading to consistent approach for computation of* ***Project Completion Date***

  - ✓ *Enabling* ***unambiguous cross-sector comparison*** *on key metrics viz.* ***Time & Cost Overrun***

  - ✓ *Introducing* ***Milestone level monitoring*** *in* ***Pre-construction stage*** *– identification of* ***any slippage before costs or timelines exceed approved limits***

Project Monitoring

Way ahead (3) - Modification of Periodic Reports

- *Examined the **pre-existing Flash Report** structure **(50+ tables)***
- ***Inconsistent marking of the Project Start Date (or Zero Date) led to varied computation of the Project Completion Date***
  - *Ambiguous cross-sector comparison*
  - *Erroneous conclusions in newspapers and articles citing Ministry reports*
- ***New Flash Report from June 2024 onwards***
  - ✓ *Concise (7 tables only)*
  - ✓ *Comprehensive*
  - ✓ *Unambiguous*

Project Monitoring

Way ahead (4): Apex-level Monitoring

- Enhancing project execution through **top-level oversight**
- Identification of ***critical projects*** and scheduling of ***Quarterly Review Meetings chaired by the Hon'ble Minister***.
- **Objective**
  - ✓ *Improved Project Outcomes*
  - ✓ *Increased Accountability*
  - ✓ *Enhanced Decision Making*
  - ✓ *Identification of bottlenecks and intervention to facilitate issue resolution*

Project Monitoring

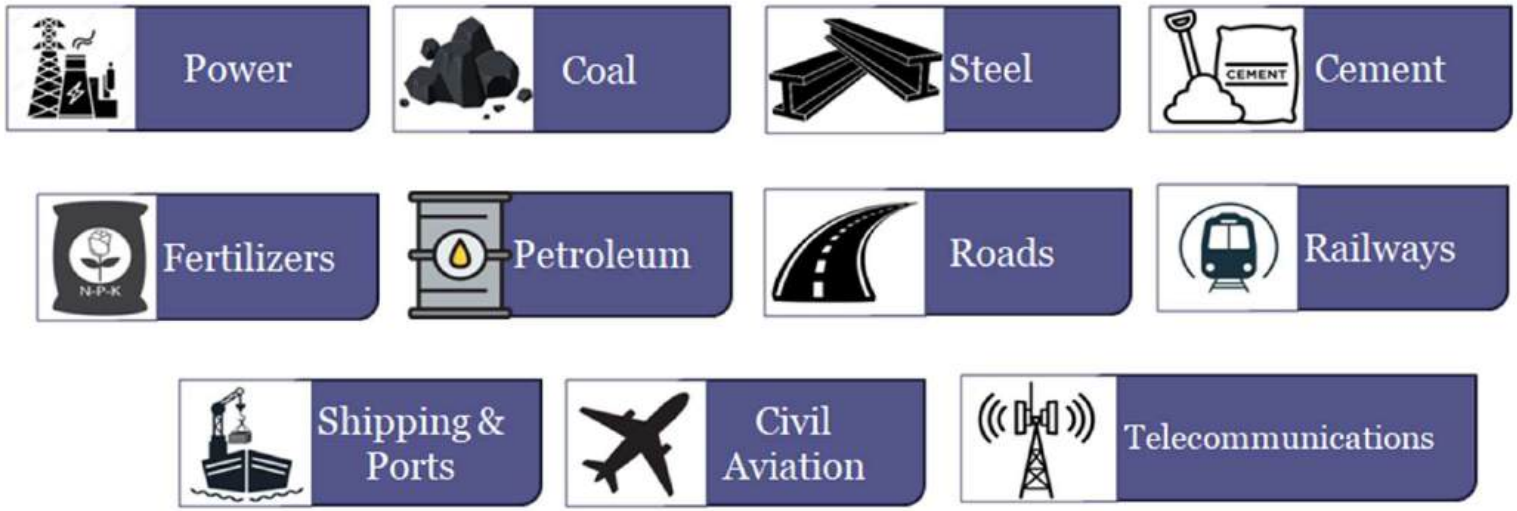
Way ahead (5)- Capacity Building of stakeholders

- Mid-level/ Senior Level **Training programme** to officers at pay levels ranging from Level 10-14 or their equivalents from Line Ministries/ Departments/CPSEs on ***"Project Planning and Management" or related subjects.***
- Quarterly training programmes - to be carried out with recognized/ reputed institutes
- **Objective**
  - ✓ *Awareness of project management practices among all the stakeholders.*
  - ✓ *A brain-storming platform - exchange of ideas / insights / best practices on project execution*
  - ✓ *Apprising the stakeholders - Importance of Data accuracy & comprehensiveness to strengthen data reporting*
  - ✓ *Raising the MoSPI's profile as the project management arm of Government of India*

Performance Monitoring

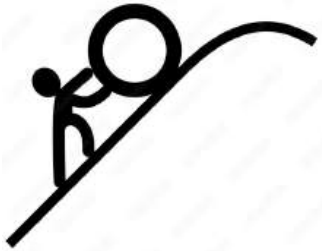
Performance Monitoring
(Existing Framework)

- ***coverage of 11 sectors – broadly Production-based parameters***
- ***Achievement against Pre-set Targets***
- *Monthly Report on Infrastructure Performance at www.cspm.gov.in*



Performance Monitoring

Challenges



• Largely unchanged for over 10 years

• **Lacking comprehensiveness & Faded in relevance** - Sea change in the sectors/key monitoring parameters characterizing National Infrastructure Performance

• Largely Production-based parameters, **missing significantly to capture the measure of infrastructure statistics**

• Limited to releasing reports only

• **No index-based reporting** for Cross-Industry comparison

• Other GoI entities viz. ***eight core industries by O/o Economic Advisor, MoC&I*** and **Index of Industrial Production (IIP) by ESD, MoSPI** conduct similar reporting, widely used by PIB or Media

Performance Monitoring

Way Ahead (6): Formulation of a robust framework /roadmap

- **8-week consultancy study** being undertaken by a designated institute
  - ✓ *A robust framework with identified short-term, mid-term & long tem goals*
  - ✓ *Report/ output structure to Enhance data-driven decision-making*
  - ✓ *Index Formulation for cross-sector comparison*
  - ✓ *Identification of Data source/(s) & establish the quantifying measures*
  - ✓ *Establish a measure of infrastructure statistics.*
  - ✓ *Identification of Requirements:* Manpower, Technology, and Budget

Strengthening of Infrastructure & Project Monitoring

Strengthening of Infrastructure & Project Monitoring

Way Ahead(7): Setting of Project & Performance Monitoring Unit (PPMU)

- **PPMU establishment with a team of 7 personnel is being established** with **multidisciplinary domain expertise**

- Introducing **vertical and cluster-based monitoring** mechanism **across Four pillars:**
  - ✓ *Project Appraisal,*
  - ✓ *Project Monitoring,*
  - ✓ *Performance Monitoring &*
  - ✓ *Capacity Building of stakeholders.*

- 7 highly skilled personnel to be recruited through reputable firms

7-entity PPMU

Triple-focus monitoring of 4-pillars

- ✓Project Appraisal,
- ✓Project Monitoring,
- ✓Performance Monitoring and
- ✓ Capacity Building of stakeholders.

Project Management Lead

Vertical 1

- **Transport & Logistics Cluster *(Metro, Roads, Railways, Civil Aviation, Shipping & Ports)***

Senior Consultant + Consultant

Vertical 2

- **Energy Cluster *(Renewable Energy, Atomic Energy, Hydrogen Energy, Power, Coal, Petroleum and Natural Gas)***
- **Social Cluster *(Social Infrastructure, Education, Health, Tourism, Sports Infrastructure)***

Senior Consultant + Consultant

Vertical 3

- **Urban & Rural**
- **Digital, Industrial & Defence**
- **PMO, NITI Aayog, Dept. of Finance**

Senior Consultant + Consultant

Objective: 7-entity PPMU

Triple-focus monitoring of 4-pillars

- Enhanced **Cluster-based** Project & Performance Monitoring; Predictive analysis, forecasting /pre-emptive issue resolution
- **Improvising the Report/Output structure** for usage at various apex level viz. PMO, NITI, etc.
- **Unique Project Identification Number (UPIN)** and **Index formulation for rating of LM/D -** *Project execution & Infrastructure Sector Performance*
- **Facilitating Project execution :** Framework for extending support to LM/D & Fast Tracking
- **Ministry-Industry-Academia Collaboration:** Capacity building of all stakeholders
- **Third-Party Audit (TPA)** of critical Projects
- **Policy Intervention:** Long-term strategic approach & proposals
- Facilitating the **Project-Appraisal** Committees.
- Enhanced **data-driven decision making**: Periodic Policy notes/ Articles

Strengthening of Infrastructure & Project Monitoring

Way Ahead(8): Formulation of a Robust framework for "Monitoring & Evaluation - Viksit Bharat @2047"

- **8-week consultancy study** being undertaken through a designated institute:

  ✓ *Establishing Framework*

  ✓ *Robust monitoring mechanism with identified short-term, mid-term and long-term goals.*

  ✓ *Identification of Data source*

  ✓ *Establish the quantifying measures.*

  ✓ *Report/output structure to enhance data-driven decision-making*

  ✓ *Index Formulation*

  ✓ *Identification of Requirements:* Manpower, Technology, and Budget

Thank You