**Task 1.**

**Title:**

Guest Lecture Review Report

**Guest Lecture: Data Analytics Business Impact (Richard)**  
Richard’s guest lecture focused on the key skills and mindsets required to succeed in the data analytics industry, drawing from his own professional experience. He outlined how rapidly changing technologies require adaptability and highlighted the importance of human-centred skills.  
I was particularly interested in Richard’s emphasis on communication, storytelling, and audience awareness. Rather than mastering a specific tool, he emphasised the value of insights for action and understanding the client's context, particularly in differentiating between positions (e.g. line managers and senior executives). His point about focusing presentations for time-constrained audiences was insightful. These practical tips provided me with a clearer understanding of the soft skills I need to develop alongside technical expertise to thrive in the field.

**Guest Lecture: AimSmarter and Real-world Applications of Big Data (Tony Adole)**  
Tony introduced AimSmarter, a UK-based company providing data analytics services. The lecture covered how AimSmarter supports businesses in making informed decisions through data collection, processing, and analysis. Their services include data visualisation, predictive analytics, data governance, and quality management.  
It was insightful to see how various tools, including Python, R, SQL, Power BI, and Tableau, are applied depending on client needs. I was particularly interested in how AimSmarter integrates analytics to enhance operational efficiency and create predictive models. The lecture clearly illustrated how data analytics functions in a real business context and helped me understand how technologies are tailored for client-specific solutions.

**Guest Lecture: 7 Unified Data Architecture 2.0 (Shobana Sridaran)**  
Shobana discussed her experience in data analytics and introduced real-world applications, including sales forecasting, airline route profitability analysis, and retail analysis. She then explained the concept of data architecture, highlighting its role in efficiently organising and processing data.  
I was especially interested in the six-layer model of data architecture, which includes Sources, Ingestion and Transport, Storage, Query and Processing, Transformation, and Analysis and Output. It was fascinating to see how different departments, like Business Intelligence or Data Processing, prioritise different layers. The lecture helped me understand how data moves through an organisation and offered clarity on which part of the analytics workflow might best align with my interests.

**Task 2.**

**Title:**

Geographical Difference in Maternal Mortality Ratio (MMR): A WHO Regional Comparison through Data Visualisation

1. **Objectives**

Objective 1: Analyse the central tendency and distribution of MMR across WHO regions

 Reveals regional inequality in maternal health outcomes

 Identifies variation within and between areas through median and range values

Objective 2: Identify the top 10 and bottom 10 countries by MMR

 Highlights the extremes of global maternal health outcomes

 Demonstrates the severity of the difference between countries

Objective 3: Visualise MMR on a world map

 Provides an intuitive geographic understanding of mortality distribution

 Helps identify global clusters of high or low maternal mortality

Objective 4: Show confidence intervals to represent uncertainty in maternal mortality estimates

 Acknowledges variation in data reliability, especially in low-resource settings

 Visualises data quality differences between countries

 Adds depth to analysis by showing both the point estimate and its uncertainty

1. **Justification of the data compilation**

Objective 1:

Analyse the central tendency and distribution of maternal mortality rates across WHO regions

* ParentLocation: Groups countries into WHO regions for comparative analysis
* FactValueNumeric: Provides actual MMR used to calculate medians and ranges
* Location type: Filters to include only individual countries
* Period: filter year as 2023 to provide analysis on the present condition
* Indicator: MMR per 100,000 live births

Objective 2:

Identify the top 10 and bottom 10 countries by MMR

* Location: Displays the names of individual countries for ranking
* ParentLocation: Groups countries into WHO regions for comparative analysis
* FactValueNumeric: Enables sorting and comparison based on MMR
* Top 10 Region Avg: Calculated field presenting the top 10 regional averages
* Bot 10 Region Avg: Calculated field presenting the bottom 10 regional averages
* Location type: Filters to include only individual countries
* Period: filter year as 2023 to provide analysis on the present condition
* Indicator: filter Maternal Mortality Ratio (MMR) per 100,000 live births

Objective 3:

Visualise MMR on a world map

* Longitude: Generated from Location applying geographical role
* Latitude: Generated from Location applying geographical role
* Region Avg MMR: Calculated field presenting the average of MMR by region.
* Location type: Filters to include only individual countries
* Period: filter year as 2023 to provide analysis on the present condition
* Indicator: filter Maternal Mortality Ratio (MMR) per 100,000 live births

Objective 4:

Show confidence intervals to represent uncertainty in maternal mortality estimates

* FactValueNumericLow & FactValueNumericHigh: Define the lower and upper bounds of the confidence interval
* Confidence Interval: Calculated field presenting confidence interval (FactValueNumericHigh – FactValueNumericLow)
* Location type: Filters to include only individual countries
* Period: filter year as 2023 to provide analysis on the present condition
* Indicator: filter Maternal Mortality Ratio (MMR) per 100,000 live births
* Location: Displays the names of individual countries for ranking

1. **Description of the Dataset**

Dataset Overview and Regional Distribution (Box Plot - Objective 1)

* The dataset includes MMR values across six WHO regions for 2023, measured per 100,000 live births.
* Africa shows the widest and highest distribution of MMR values, with a median of around 258.2.
* Europe displays the lowest regional mortality ratios, with most countries clustering under 50, and a minimum value of 1.1.
* The Americas and South-East Asia show moderate ranges, but with greater variance than Europe.
* Eastern Mediterranean and Western Pacific show a comparatively high range compared to the Americas and South-East Asia.
* Several outliers exist in Africa, the Americas and the Eastern Mediterranean, indicating extreme MMR values in some countries (e.g., Nigeria, Afghanistan, etc).

Understanding Data Quality & Uncertainty (Confidence Intervals - Objective 4)

* Confidence Intervals (CIs) were visualised for the top and bottom 10 countries using MMR values to represent uncertainty.
* Top 10 countries like the Central African Republic (965.8) and South Sudan (854.4) exhibit wide confidence intervals, signalling significant uncertainty in estimates due to data limitations.
* Bottom 10 countries (e.g., Denmark, Japan, Cook Islands) have extremely narrow CIs, suggesting high-quality, reliable civil registration and health data.
* Some countries show overlapping CIs despite different point estimates, indicating that MMR rankings may be uncertain.
* WHO’s methodological notes reinforce the need for CI visualisation, maternal deaths are often underreported and misclassified, especially in low-resource settings (WHO, n.d.).
* These plots reveal that the bottom 10 countries' MMR values are more trustworthy, and where caution is needed in interpretation and comparison.

1. **Analytics and Visualisations of findings with descriptions**

Objective 1.

텍스트, 스크린샷, 도표, 평행이(가) 표시된 사진

AI가 생성한 콘텐츠는 부정확할 수 있습니다.

Findings: Maternal Mortality Distribution by WHO Region (2023)

* Africa exhibits the widest distribution and the highest median maternal mortality ratio (MMR) (258.2 per 100,000 live births), with extreme outliers reaching nearly 1,000, underscoring a severe maternal health crisis and possible internal regional inequality of maternal health systems.
* The Americas present a comparatively moderate range of outcomes, with a median of 52.8, but also include outliers as high as 327.6, suggesting uneven access to maternal care across the region.
* Europe reports the lowest overall median (6.5) and the smallest spread, indicating high consistency and strong maternal health systems across its countries.
* Eastern Mediterranean and Western Pacific show a comparatively high range compared to the Americas and South-East Asia. However, the Eastern Mediterranean (25.6) has a lower median compared to the Americas (52.8) and South-East Asia (80.5), which represents extreme internal regional inequalities in maternal health systems.
* The contrast between Europe and Africa reveals a more than 40-fold difference in the median maternal mortality ratio, exposing deep disparities in maternal health outcomes between regions.

Objective 2.

텍스트, 스크린샷, 평행, 도표이(가) 표시된 사진

AI가 생성한 콘텐츠는 부정확할 수 있습니다.

Findings: Comparative Analysis of Maternal Mortality Ratios Across WHO Regions (Top and Bottom 10 Countries, 2023)

Top 10 Countries by Maternal Mortality Ratio

* Africa dominates the top 10 with 8 out of 10 countries, and its regional average MMR is exceptionally high (658.7 per 100,000 live births), highlighting a critical maternal health crisis.
* The visualisation also highlights the disparity between countries in Africa. The gap between Nigeria and Guinea is a practical example of it.
* Eastern Mediterranean appears with two countries (Afghanistan and Somalia), averaging 541.6, indicating a severe regional burden.

Bottom 10 Countries by Maternal Mortality Ratio

* Europe has seven countries in the bottom 10, showing exceptional maternal health outcomes. The regional average MMR for these countries is just 2.093, emphasising well-established healthcare systems.
* Western Pacific contributes with Australia and the Cook Islands, holding a modest regional average of 1.220, the lowest among all regions in this analysis.
* Eastern Mediterranean’s inclusion of UAE (with an MMR of 2.540) shows some within-region disparity, sharply contrasting with Afghanistan and Somalia’s high rates.

Cross-Group Observations

* There is a more than 9,000-fold difference between the highest individual MMR (Nigeria: 992.8) and the lowest (Cook Islands: 0.110), underscoring the global disparity.
* Regionally averaged Top 10 vs. Bottom 10 MMR values reveal how systemic inequality is persistent and deeply regionalised.
* The visualisation shows that regions with high Top 10 MMR rarely appear in Bottom 10 lists, confirming differences in maternal health access.

Objective 3.

텍스트, 지도이(가) 표시된 사진

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Findings: WHO Region-level Geographic Distribution of MMR

* Africa (310.9) shows the highest average MMR, clearly distinguished with the darkest colour tone, indicating a severe public health disparity.
* Eastern Mediterranean (98.7) and Western Pacific (78) regions display the second and third highest average MMR values, showing persistent maternal health challenges.
* The Americas (66.8) exhibit a moderate MMR average. However, it appears comparatively high compared to Europe (8.9).
* Europe (8.9) has the lowest MMR averages, with a significant gap in MMR suggesting a possible great difference in healthcare systems and effective maternal care policies.
* The colour gradient in the choropleth map allows for intuitive comparison across WHO regions, making it evident that maternal mortality is not evenly distributed globally.
* This visualisation strongly supports the existence of geographical disparities in maternal health outcomes, highlighting where international aid and policy intervention may be most urgently needed.

Objective 4

텍스트, 스크린샷, 도표, 다채로움이(가) 표시된 사진

AI가 생성한 콘텐츠는 부정확할 수 있습니다.

Findings from the Visualisation:

* The Top 10 countries with the widest confidence intervals are mainly in Africa and the Eastern Mediterranean region.
  + These wide intervals highlight the lack of precision in the estimates due to a lack of data quality and stable reporting systems.
* The Bottom 10 countries have extremely narrow confidence intervals (CI), sometimes below 1.0.
  + This suggests comparatively strong data quality and stable reporting systems, enhancing the comparability and trustworthiness of their MMR.

In conclusion, the point estimates alone can be misleading when comparing countries.

1. **Analysis Finding Comparison to Media and Publication Findings**

Analytics Findings:

* Significant internal MMR difference in the Africa region, and especially Severe in Nigeria (Objective 1 and 2)
* Significant internal MMR difference in the Eastern Mediterranean region (Objective 1 and 2)
* Significant MMR difference between Europe and Africa (Objective 1 and 3)

Media and Publication Findings:

The result of Krugman (2024) aligns with the findings from Objectives 1 and 2. The internal MMR gap is caused by Sub-Saharan Africa’s growing health financing gap as external aid declines and domestic spending fails to keep pace (Krugman, 2024).

The result of PT, CC and EU (2021) aligns with the findings from Objectives 1 and 2. Nigeria has one of the highest maternal mortality rates globally, exceptionally high in northern Nigeria due to regional disparities, such as lower income, education and limited health access (PT, CC and EU, 2021)

The result of Seddighi, Nosrati Nejad and Basakha (2020) aligns with the findings from Objectives 1 and 3. The internal difference in the Eastern Mediterranean is caused by health system efficiency. As the visualisation in Objective 2 highlighted, the United Arab Emirates was one of the countries with an efficient health system (Seddighi, Nosrati Nejad and Basakha, 2020).

The result of Ould-Boudia et al. (2024) aligns with the findings from Objectives 1 and 2. This study reveals severe health disparities between African and European countries, driven primarily by income levels and healthcare access, and calls for region-specific policy interventions (Ould-Boudia *et al.*, 2024).

1. **Conclusions**

Data Limitation

 Several extreme outliers in Africa, the Americas, and the Eastern Mediterranean regions highlight possible inconsistencies in data reporting and country-level healthcare disparities.

 Broad Confidence intervals (CIs) range demonstrated that high MMR values, particularly in countries like the Central African Republic and South Sudan, come with substantial uncertainty, reflecting weaker data infrastructures.

 Conversely, countries with low MMR values, such as Denmark and Japan, had extremely narrow CIs, indicating more reliable civil registration systems and higher data quality.

 WHO guidance supports the use of CIs to understand uncertainty, particularly in low-resource settings where maternal death underreporting and misclassification are common.

 This analysis demonstrates that while MMR rankings provide valuable insights, conclusions must be drawn with caution, especially when comparing across regions with varying levels of data reliability.

Alignment Between Analytical Findings and External Sources

 The significant internal disparities in maternal mortality within Africa, particularly the severe rates in Nigeria, were confirmed by PT, CC and EU (2021), who noted extreme regional differences in health access, income, and education within the country.

 The wide internal gap within the Eastern Mediterranean region observed in the analysis aligns with findings by Seddighi, Nosrati Nejad, and Basakha (2020), who highlighted differences in national health system efficiency, as evidenced by countries like the UAE showing notably low MMR rates.

 The analysis finding of a sharp contrast in MMR between Africa and Europe is consistent with Ould-Boudia et al. (2024), who attributed such disparities to systemic income and healthcare access inequalities.

 Krugman (2024) supports the observed regional variation within Sub-Saharan Africa, highlighting a growing health financing gap resulting from reduced international aid and insufficient domestic spending.

 These alignments between independent data analysis and scholarly/media publications strengthen the reliability of the findings and confirm that MMR variation is not only statistically observable but also rooted in broader structural and policy-driven issues.

Recommendation

Recommendations for Improving Efficiency in Underperforming Health Systems in the Eastern Mediterranean Region (Seddighi, Nosrati Nejad and Basakha, 2020):

 Optimise the allocation and use of existing health resources rather than simply increasing spending.

 Benchmark efficient regional peers (e.g., Iran, Tunisia) to guide structural and policy reforms.

 Invest in system-level improvements such as preventive care, care coordination, and health governance.

 Align health investments with population needs and improve strategic planning and accountability.

Key Intervention to Reduce Africa’s Internal Health Financing Gap (Krugman, 2024):

* Strengthen domestic political commitment by repositioning health as a central pillar of economic growth.
* Expand public health insurance initiatives to advance universal health coverage (UHC) across African nations.
* Focus on the quality of care, not just increasing facilities, but also ensuring access to essential medicines, trained personnel, and effective infection control.
* Implement gradual and coordinated aid reduction strategies to minimise disruptions to existing health gains.

Political Intervention for Reducing Health Disparities Between Africa and Europe (Ould-Boudia *et al.*, 2024):

 Expand healthcare infrastructure across underserved regions.

 Strengthen hygiene measures and preventive health programs.

 Improve child and maternal health outcomes through targeted interventions.

 Invest in health workforce development and essential medicines.

 Promote international collaboration to bridge global health equity gaps.

1. **References**

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