

PUSAKA collaboration project report

Collaborators:

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- Muhammad Dylan Pahlevi
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Domain expert Info

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Date of meetings:

Haven't met but already chatted on Whatsapp since **21st April 2024** for TA5.0 and continue on **6th May 2024** for TA5.1 and **10th May 2024** for additional meetings (for TA5.3).

K1: Kualitatif

K1 is the project's initial Kualitatif component, which sets the foundation for the Kuantitatif component of the project (K2) and the implementation of the solution (K3). Specifically, there are seven aspects of K1 relevant for every project.

A: What is the domain problem? Be sure to write down their overall research/business/policy goals and their specific scientific questions.

Indonesian:

Masalah domain yang dihadapi adalah untuk meneliti perbedaan kadar logam berat pada dua jenis botol plastik PET, yaitu virgin PET dan recycle PET. Kedua jenis plastik ini dikondisikan pada dua regulasi yang berbeda, yaitu sesuai regulasi EU dan BPOM. Tujuan penelitian secara keseluruhan adalah untuk menganalisis pengaruh jenis plastik dan regulasi terhadap kadar logam berat pada botol plastik PET. Pertanyaan ilmiah spesifiknya adalah:

1. Apakah ada pengaruh jenis plastik (virgin PET dan recycle PET) terhadap kadar logam berat?
2. Apakah ada pengaruh regulasi (EU dan BPOM) terhadap kadar logam berat?
3. Apakah terdapat interaksi antara jenis plastik dan regulasi terhadap kadar logam berat?

English:

The problem faced is to investigate the differences in heavy metal levels between two types of PET plastic bottles, namely virgin PET and recycled PET. Both types of plastics are conditioned under two different regulations, namely in accordance with EU and BPOM regulations. The overall research objective is to analyze the influence of plastic type and regulations on heavy metal levels in PET plastic bottles. The specific scientific questions are:

1. Is there an influence of plastic type (virgin PET and recycled PET) on heavy metal levels?
2. Is there an influence of regulations (EU and BPOM) on heavy metal levels?
3. Is there an interaction between plastic type and regulations on heavy metal levels?

B: Why is this problem important or interesting? This should be answered individually by each collaborator on the project: Why is your domain expert's research/business/policy question interesting to you? If it's not interesting, make up a plausible reason.

Indonesian:

Masalah ini penting dan menarik karena berhubungan dengan keamanan pangan dan kesehatan masyarakat. Botol plastik PET banyak digunakan untuk mengemas produk makanan dan minuman. Adanya logam berat pada kemasan plastik dapat membahayakan kesehatan konsumen jika termigrasi ke dalam produk yang dikemas. Penelitian ini dapat memberikan informasi penting mengenai pengaruh jenis plastik dan regulasi terhadap kadar logam berat, sehingga dapat dijadikan acuan dalam pemilihan jenis plastik dan penerapan regulasi yang tepat untuk menjamin keamanan produk yang dikemas.

English:

This issue is important and interesting because it relates to food safety and public health. PET plastic bottles are widely used to package food and beverages. The presence of heavy metals in plastic packaging can endanger consumer health if they migrate into the packaged products. This research can provide valuable information regarding the influence of plastic type and regulations on heavy metal levels, thus serving as a reference for selecting the appropriate plastic type and implementing regulations to ensure the safety of packaged products.

C: How will the eventual solution be used? How they will use the answers to their research questions (i.e., what is their intended outcome of the research) and how will this help achieve the overall goal of the project?

Indonesian:

Solusi akhir dari penelitian ini akan digunakan sebagai dasar untuk menentukan jenis plastik PET dan regulasi yang paling tepat untuk digunakan dalam pengemasan produk makanan dan minuman. Jika ditemukan bahwa jenis plastik atau regulasi tertentu menghasilkan kadar logam berat yang lebih rendah, maka jenis plastik atau regulasi tersebut dapat direkomendasikan untuk digunakan dalam industri pengemasan. Hal ini akan membantu mencapai tujuan keseluruhan proyek, yaitu menjamin keamanan produk yang dikemas dalam botol plastik PET bagi konsumen.

English:

The final solution from this research will be used as the basis for determining the most suitable type of PET plastic and regulations to be used in packaging food and beverages. If it is found that a certain type of plastic or regulation results in lower levels of heavy metals, then that type of plastic or regulation can be recommended for use in the packaging industry. This will help achieve the overall goal of the project, which is to ensure the safety of products packaged in PET plastic bottles for consumers.

D: What potential data could solve the domain problem? I.e., what data, if it were available and accessible, would help answer the underlying research questions or guide the business or policy decisions? This is an important hypothetical exercise.

Indonesian:

Data potensial yang dapat memecahkan masalah domain ini adalah data kuantitatif mengenai kadar logam berat seperti kadmium (Cd), merkuri (Hg), timbal (Pb), dan antimon (Sb) pada botol plastik PET jenis virgin dan recycle yang dikondisikan pada regulasi EU dan BPOM. Data ini diperoleh melalui pengujian laboratorium dengan metode dan instrumen yang valid dan terpercaya.

English:

The potential data that can solve this domain problem is quantitative data regarding the levels of heavy metals such as cadmium (Cd), mercury (Hg), lead (Pb), and antimony (Sb) in virgin and recycled PET plastic bottles conditioned under EU and BPOM regulations. This data is obtained through laboratory testing using valid and reliable methods and instruments.

E: The actual data (only if data have already been collected)

E1: What data have been collected?

E2: Why were the data collected originally? (For what purpose?)

E3 and E4: When and where were the data collected?

E5: Who or what collected the data?

E6: How were the data collected? With what instrumentation/methods?

Indonesian:

Data yang telah dikumpulkan adalah data kuantitatif berupa kadar logam berat kadmium (Cd), merkuri (Hg), timbal (Pb), dan antimon (Sb) pada botol plastik PET jenis virgin dan recycle yang dikondisikan pada regulasi EU dan BPOM. Data ini dikumpulkan untuk penelitian tesis yang bertujuan menganalisis pengaruh jenis plastik dan regulasi terhadap kadar logam berat pada botol plastik PET.

Data dikumpulkan pada tahun 2023, di laboratorium pengujian yang memadai. Data dikumpulkan oleh peneliti atau pihak yang bertanggung jawab dalam penelitian tersebut. Data dikumpulkan melalui pengujian laboratorium dengan metode dan instrumentasi yang valid dan terpercaya, seperti spektrofotometri atau kromatografi.

English:

The collected data is quantitative data consisting of the levels of heavy metals cadmium (Cd), mercury (Hg), lead (Pb), and antimony (Sb) in virgin and recycled PET plastic bottles conditioned under EU and BPOM regulations. This data was gathered for a thesis research aimed at analyzing the influence of plastic types and regulations on the levels of heavy metals in PET plastic bottles.

The data was collected in 2023, in a well-equipped testing laboratory. It was collected by the researchers or responsible parties involved in the research. The data collection was conducted through laboratory testing using valid and reliable methods and instrumentation, such as spectrophotometry or chromatography.

F. What may be the Kualitatif relationships between variables, for those observed and unobserved?

Indonesian:

Beberapa hubungan kualitatif yang mungkin terjadi antara variabel dalam penelitian ini adalah:

1. Jenis plastik (virgin PET atau recycle PET) dapat mempengaruhi kadar logam berat secara berbeda. Plastik recycle PET berpotensi memiliki kadar logam

berat yang lebih tinggi dibandingkan virgin PET karena adanya kemungkinan kontaminasi selama proses daur ulang.

2. Regulasi (EU atau BPOM) dapat mempengaruhi kadar logam berat karena adanya perbedaan dalam standar dan batasan yang ditetapkan.
3. Terdapat kemungkinan interaksi antara jenis plastik dan regulasi dalam mempengaruhi kadar logam berat. Misalnya, pengaruh regulasi terhadap kadar logam berat mungkin berbeda antara virgin PET dan recycle PET.
4. Faktor-faktor lain yang tidak diamati seperti proses produksi, kondisi penyimpanan, atau kontaminasi lingkungan juga dapat mempengaruhi kadar logam berat pada botol plastik PET.

English:

Some qualitative relationships that may occur between variables in this study are as follows:

1. The type of plastic (virgin PET or recycled PET) may affect the levels of heavy metals differently. Recycled PET plastic potentially has higher levels of heavy metals compared to virgin PET due to the possibility of contamination during the recycling process.
2. Regulations (EU or BPOM) may influence the levels of heavy metals due to differences in standards and limits set.
3. There is a possibility of interaction between the type of plastic and regulations affecting the levels of heavy metals. For example, the influence of regulations on heavy metal levels may differ between virgin PET and recycled PET.
4. Other unobserved factors such as production processes, storage conditions, or environmental contamination may also affect the levels of heavy metals in PET plastic bottles.

G: Which types of statistical analyses or techniques might be most useful to the domain expert? Which would not be useful?

Indonesian:

Analisis statistik yang mungkin paling berguna dalam penelitian ini adalah:

1. Uji normalitas data untuk menentukan apakah data terdistribusi normal atau tidak.
2. Analisis varians (ANOVA) dua arah untuk menguji pengaruh jenis plastik, regulasi, dan interaksi keduanya terhadap kadar logam berat.
3. Uji lanjut seperti uji Tukey atau Bonferroni untuk mengidentifikasi perbedaan yang signifikan antara kelompok perlakuan jika terdapat pengaruh yang signifikan.

Analisis statistik yang mungkin tidak berguna dalam penelitian ini adalah analisis regresi, karena variabel independen (jenis plastik dan regulasi) bersifat kategorikal.

English:

Statistical analysis that may be most useful in this study includes:

1. Normality testing of data to determine whether the data is normally distributed or not.
2. Two-way analysis of variance (ANOVA) to test the influence of plastic type, regulations, and their interaction on heavy metal levels.
3. Post-hoc tests such as Tukey or Bonferroni tests to identify significant differences between treatment groups if there are significant effects.
4. Statistical analysis that may not be useful in this study is regression analysis, as the independent variables (plastic type and regulations) are categorical.

K2: Kuantitatif

Summarize the statistical collaborators' Kuantitatif contribution/advice. Did the domain expert understand the statistics? This can be whatever (if any) Kuantitatif contribution/advice you provided during the initial meeting or in a subsequent follow-up email. If there has not been any K2 advice so far, indicate your thoughts of potential directions for K2.

Indonesian:

Belum ada kontribusi atau saran kuantitatif yang spesifik dari kolaborator statistik. Namun, beberapa potensi arah untuk K2 dapat disarankan sebagai berikut:

1. Melakukan uji normalitas data kadar logam berat untuk setiap kelompok perlakuan (kombinasi jenis plastik dan regulasi) menggunakan uji Shapiro-Wilk atau Kolmogorov-Smirnov.
2. Jika data terdistribusi normal, dapat dilanjutkan dengan Analisis Varians (ANOVA) dua arah untuk menguji pengaruh jenis plastik, regulasi, dan interaksi keduanya terhadap kadar logam berat.
3. Jika asumsi normalitas tidak terpenuhi, dapat digunakan uji non-parametrik seperti Kruskal-Wallis untuk menguji pengaruh jenis plastik dan regulasi secara terpisah, serta uji Friedman untuk menguji interaksi keduanya.
4. Jika terdapat pengaruh yang signifikan, dapat dilakukan uji lanjut seperti uji Tukey atau Bonferroni (untuk data normal) atau uji Mann-Whitney dengan koreksi Bonferroni (untuk data tidak normal) untuk mengidentifikasi perbedaan yang signifikan antara kelompok perlakuan.

5. Melakukan analisis multivariat seperti MANOVA (Multivariate Analysis of Variance) untuk menguji pengaruh jenis plastik dan regulasi terhadap seluruh kadar logam berat (Cd, Hg, Pb, Sb) secara bersamaan.
6. Membuat visualisasi data seperti plot means, boxplot, atau interaction plot untuk membantu interpretasi hasil analisis.

Namun, saran kuantitatif yang lebih spesifik dapat diberikan setelah mendiskusikan secara lebih mendalam dengan ahli domain mengenai desain eksperimen, asumsi yang terpenuhi, dan tujuan analisis yang lebih rinci.

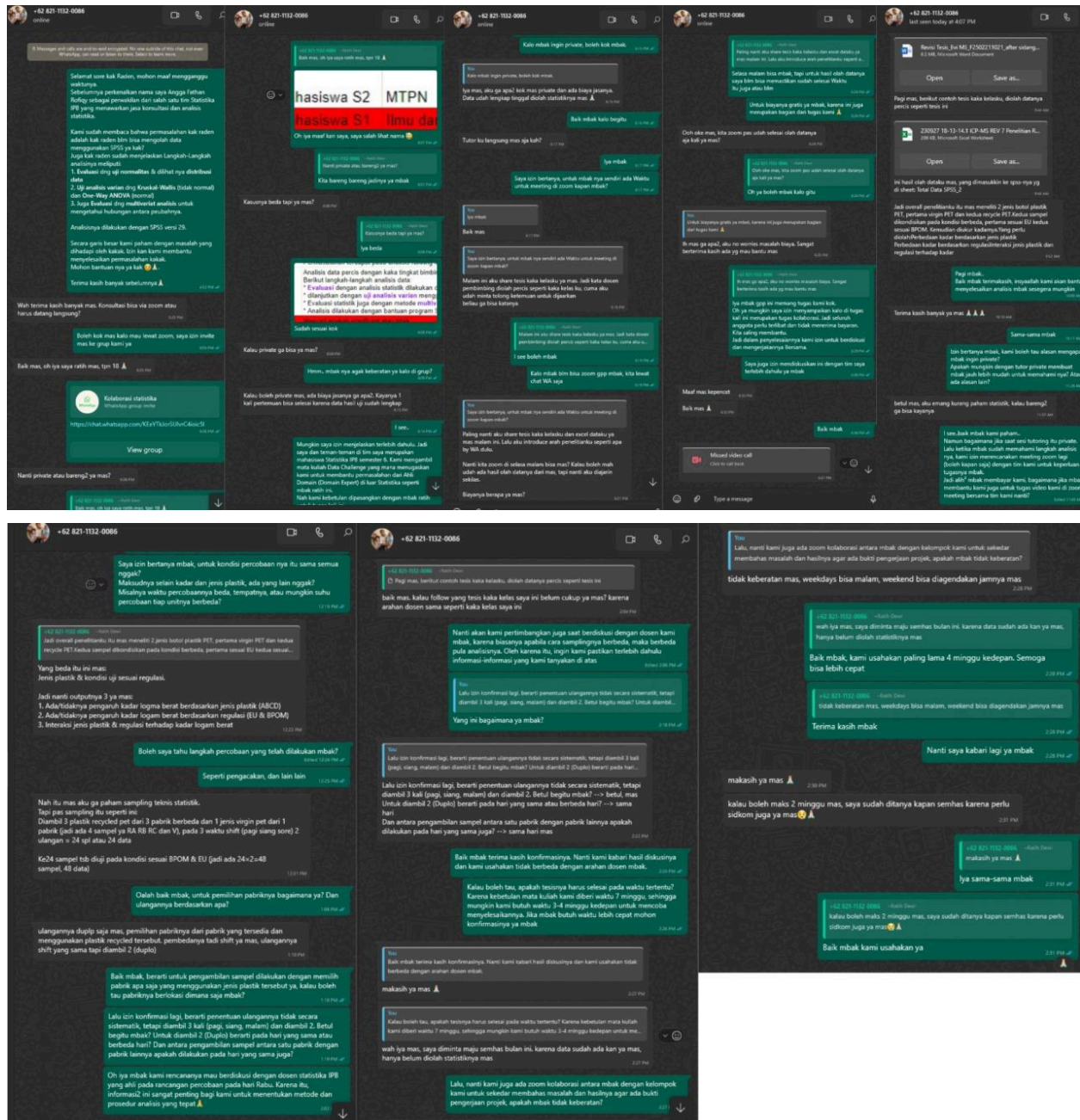
English:

There have been no specific quantitative contributions or suggestions from the statistical collaborator. However, some potential directions for K2 can be suggested as follows:

1. Conducting normality tests for heavy metal data for each treatment group (combination of plastic type and regulations) using the Shapiro-Wilk or Kolmogorov-Smirnov test.
2. If the data is normally distributed, proceed with two-way analysis of variance (ANOVA) to test the influence of plastic type, regulations, and their interaction on heavy metal levels.
3. If the normality assumption is not met, non-parametric tests such as Kruskal-Wallis can be used to test the influence of plastic type and regulations separately, and the Friedman test can be used to test their interaction.
4. If significant effects are found, further tests such as Tukey or Bonferroni (for normal data) or Mann-Whitney test with Bonferroni correction (for non-normal data) can be conducted to identify significant differences between treatment groups.
5. Perform multivariate analysis such as MANOVA (Multivariate Analysis of Variance) to test the influence of plastic type and regulations on all heavy metal levels (Cd, Hg, Pb, Sb) simultaneously.
6. Create data visualizations such as means plots, boxplots, or interaction plots to aid in the interpretation of analysis results.
7. However, more specific quantitative suggestions can be provided after discussing in more depth with domain experts regarding experimental design, met assumptions, and more detailed analysis goals.

Lampiran (Appendices)

Chat dengan DE



- Tesis Evi (kating beliau)
- Data (**sheet**: Total Data SPSS_2)