

Strategic Planning for the Adoption of Locally Manufactured Biologic Drugs in Saudi Arabia

استراتيجيات التخطيط لاعتماد الأدوية البيولوجية المصنعة في
المملكة العربية السعودية

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Abstract:

This study investigates the public acceptance of locally manufactured biologic drugs in Saudi Arabia, within the broader context of the Kingdom's strategic shift toward national pharmaceutical production under Vision 2030. A bilingual electronic questionnaire was distributed to a diverse sample of 400 respondents across different regions and age groups. The research applied the Theory of Planned Behavior (TPB) to assess how awareness, trust, previous experience, and economic factors (e.g., price and insurance) influence behavioral intention.

Findings reveal that awareness and trust in product quality significantly enhance the intention to adopt locally produced biologics, while price sensitivity and ineffective awareness campaigns act as key barriers. Statistically significant gender differences were also observed, with males showing higher adoption willingness.

The study recommends redesigning awareness campaigns based on behavioral segmentation and demographic targeting, with an emphasis on product-based trust rather than institutional branding. Additionally, it calls for the integration of local biologics into national insurance programs and the adoption of value-based pricing models.

Keywords: Biologic drugs, public acceptance, local manufacturing, Saudi Arabia, health behavior, Theory of Planned Behavior.

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List of Terminology

Term	Definition
Biologic Drugs	Medicinal products derived from living organisms, including monoclonal antibodies, cytokines, and vaccines.
Locally Manufactured Biologics	Biologic drugs are produced within Saudi Arabia, as opposed to imported products.
Public Acceptance	The willingness of individuals to trust, adopt, and use locally made biologic drugs.
Health Belief Model (HBM)	A psychological model explaining health behaviors based on risk perception, benefits, and barriers.
Theory of Planned Behavior (TPB)	A theory linking beliefs and behavior through attitudes, subjective norms, and perceived control.
Diffusion of Innovation (DoI)	A theory describing how new ideas and technologies spread through a population.
Trust in Regulation	Public confidence in the policies, processes, and oversight conducted by regulatory authorities like the SFDA.
Economic Accessibility	The affordability and availability of biologic drugs, considering price, insurance coverage, and access.
Awareness Campaigns	Efforts have been made to educate the public about the benefits and safety of biologic drugs.
Behavioral Intention	The self-reported likelihood of adopting or using a biologic drug in the future.

List of Abbreviations

Abbreviation	Full Term
SFDA	Saudi Food and Drug Authority
MOH	Ministry of Health
HBM	Health Belief Model
TPB	Theory of Planned Behavior
DoI	Diffusion of Innovation
SEM	Structural Equation Modeling
KPI	Key Performance Indicator
KOL	Key Opinion Leader
EMA	European Medicines Agency
FDA	U.S. Food and Drug Administration
TAM	Technology Acceptance Model
SPIMACO	Saudi Pharmaceutical Industries and Medical Appliances Corporation
MS Pharma	A regional pharmaceutical company operating in MENA

Chapter One: General Framework of the Study

1.1 Introduction

The global pharmaceutical sector is undergoing transformation. Most nations have been relying on imports to meet the demand for medical products. Recently, states are becoming self-reliant in drug production. Several factors have contributed to this modification. COVID-19 was among the most prominent events that exposed vulnerabilities in global medicine supply chains and demonstrated the value of national sufficiency (Alshehri et al., 2023). Within the context of the Kingdom of Saudi Arabia (KSA), the localization of pharmaceutical manufacturing has been a prominent issue. The Strategic Vision 2030 agenda of KSA incorporates it as a valuable element in augmenting health security and economic diversification. The Saudi government's goal is to increase local medicine production to at least 40 percent of the national demand, strengthening of the overall continuity of the drug supply (Alshehri et al., 2023). Biopharmaceuticals are also known as biologic drugs. Typically, they include medical treatment modalities that remain derived from living organisms. Over the years, they have revolutionized treatment for most chronic illnesses, including malignancies and autoimmune disorders, offering high efficacy and safety due to their targeted action (Almalki et al., 2020). In KSA, these therapeutic agents hold a valuable promise for the healthcare system. However, successful incorporation into the KSA's health system depends on production capabilities. Additionally, public acceptance and adoption are other key factors. People have high levels of hesitancy regarding novel medical interventions. This hesitancy was particularly evident during the most recent pandemic in relation to vaccines.

Building trust and awareness among the local population is vital to attain this objective. Realizing the benefits of this investment in domestic manufacturing in KSA requires in-depth awareness and community outreach programs. In this case, it is valuable to comprehend how the KSA residents perceive locally manufactured biopharmaceuticals. Doing so is a necessity and an excellent research area. The exploration examines the interplay of awareness, trust, prior experience, and economic factors in shaping behavioral intention to use locally produced biopharmaceutical products in Saudi Arabia.

1.2 Research Problem

Biosimilar and biological medications have become widespread globally. The Saudi Food and Drug Authority (SFDA) has also been collaborating with stakeholders to establish and implement policies for certifying and supporting biological products. SPIMACO, MS Pharma, and other comparable organizations have been at the forefront of local biologic production in KSA. However, local biopharmaceutical production remains nascent. When analyzing the biopharmaceutical industry, it is a valuable pillar of any healthcare system, with its fundamental foundation remaining grounded in research and development (Tawfik et al., 2022). Within the context of Saudi Arabia, most empirical investigations focused on the diverse aspects of the pharmaceutical industry. For example, one survey focused on Saudi healthcare professionals, including physicians and pharmacists, revealing diverse perceptions about biosimilars, with some concerns emanating from their efficacy and safety, which influenced their decisions regarding prescriptions (Alanazi et al., 2024; Qahtani et al., 2024). One missing feature of existing studies in this area is the lack of capturing the perspective of the general public on this issue. The prevailing gap in the literature establishes some levels of uncertainty for

policymakers and industry stakeholders executing Vision 2030's pharmaceutical initiatives. In this study, the primary research problem is the unknown readiness of Saudi's populace to accept and utilize locally manufactured biopharmaceuticals. Like other nations internationally, Saudi Arabia aims to achieve or increase self-reliance in biopharmaceutical production. In the journey, determining the public's attitudes and perceptions about these home-generated medical products remains invaluable. Without understanding how these psychosocial and economic variables affect intention, policy efforts to localize biopharmaceutical production might not attain optimal uptake.

1.3 Research Objectives

1.3.1 General Objective

The primary objective of this study is to assess the readiness of the Saudi general population to adopt and utilize locally manufactured biopharmaceutical products, and to identify the various factors influencing this adoption.

1.3.1 Specific Objectives

When conducting this investigation, it will remain grounded on particular goals, including:

- We aim to gauge the public's awareness in the KSA about locally manufactured biopharmaceuticals and their general understanding of biologicals treatment methods.
- We aim to assess the degree of confidence in the quality of local biopharmaceutical products and in the national regulatory bodies that supervise them.

- To determine the role of previous experience with these products and how it shapes individuals' willingness to use them once locally produced.
- To evaluate the effect of diverse economic factors on the populace's adoption of these products.
- We aim to offer stakeholders evidence-based suggestions on methods that can enhance the public's acceptance and adoption of these locally produced biopharmaceutical products.

1.4 Research Questions

In pursuit of the above objectives, this exploration will remain grounded in distinct research questions. The main query will be "What is the readiness of the Saudi public to adopt locally produced biopharmaceuticals, and what factors influence this readiness?" A further analysis of this overarching question generates several sub-sections, allowing the researcher to focus on diverse aspects of interest related to the topic, including:

Q1. Awareness: What is the level of public awareness and knowledge in KSA about locally made biopharmaceuticals?

Q2. Trust: Does the public trust locally made products and the national regulatory authorities, including SFDA? How does this trust level influence their intent to use biopharmaceuticals?

Q3: Prior experience: How do past encounters with biological products affect people's decision on acquiring and using locally made biopharmaceuticals?

Q4: Economic factors: How do economic variables shape peoples' willingness to use these products? When covering this section, the factors could include product prices, availability of insurance coverage, and other financial incentives or barriers.

1.5 Research Significance

1.5.1 Theoretical Significance

From a theoretical perspective, this investigation will contribute to the emerging literature on biosimilar acceptance in KSA. In the process, it will incorporate valuable constructs from behavioral theories with empirical findings derived from the Saudi context. Recent regional studies have highlighted existing knowledge gaps related to distrust in regulatory bodies and price sensitivity, which limit the uptake of biological products within the Middle East (Alqawasmeh et al., 2025). Evaluating diverse factors that influence these habits will enable this research to establish a valuable model, thereby augmenting conceptual comprehension of the topic. Overall, the outcomes will guide further explorations in the area.

1.5.2 Practical Significance

In practical terms, the findings will inform policymakers, manufacturers, and clinicians. The SFDA oversees biosimilar registration but faces numerous barriers, including public skepticism and a lack of proper guidelines for these products (Qahtani et al., 2024). In this context, analyzing and unveiling variables that influence people's adoption of these products will be valuable. Doing so will support targeted interventions, including educational campaigns, trust-building measures, and economic incentives, thereby enhancing the effectiveness of these efforts. Experts indicate that trust, cost-saving models, and contextual factors are valuable when deploying biological products

within the Gulf region (Alanazi et al., 2024). If public attitudes remain well understood and considered, the operationalization of these models can also be feasible

1.6 Research Hypotheses

Guided by the above theoretical model, the exploration proposes these hypotheses:

- **H0 (Null):** Awareness, trust, prior experience, and financial determinants have no significant relationship with the intention to adopt locally manufactured biopharmaceuticals.
- **H1:** Higher levels of awareness about biopharmaceuticals are positively associated with behavioral intention to adopt.
- **H2:** Behavioral intention to adopt is positively associated with greater trust in product quality, manufacturing, and regulatory oversight.
- **H3:** Positive prior exposure to biologics augments behavioral intention to adopt.
- **H4:** More favorable perceptions of economic factors, including affordability, insurance coverage are positively associated with behavioral intention to adopt.

1.7 Research Boundaries

Every study must focus on definite boundaries. Considering this, the investigation will be limited to the kingdom of Saudi Arabia. All participants will be residing in the different regions of Saudi Arabia. The findings and conclusions aim to reflect the Saudi context. Respondents will encompass adults from KSA aged 18 years. Mostly, the survey will target the public rather than health professionals. The exploration is cross-section. In this case, researchers will gather data during the 2024-2025 academic year. During this

time, researcher will collect public perceptions during a period when KSA continues to advance and support the usage of local biopharmaceutical initiatives and products in correlation with the Vision 2020. The subject matter will be analyzing the implications of awareness, trust, previous experiences, and economic variables on the adoption of locally manufactured biologic products. The dependent variable will be behavioral intention to adopt or use local biologics. Independent variables will include awareness, trust, previous experience, and economic factors.

1.8 Operational Definition of Terms

- **Biologic Drugs or Biopharmaceutical Products:** Medications derived from living systems and valuable in managing chronic and other life-threatening illnesses (Mascarenhas-Melo et al., 2024).
- **Public Perception:** People's views, attitudes, and beliefs towards biologics.
- **Previous Experience (with biologics):** Prior exposure to biologics can occur either as a patient or as a family member whose patient receives these products.
- **Economic Access:** The extent to which an individual can afford and obtain drugs. It includes price sensitivity, insurance coverage, and the presence of a working market for the product.
- **Regulatory Confidence:** The general populace's trust in regulating bodies, especially the SFDA, to guarantee the safety and efficiency of drugs.
- **Behavioral Intention:** An individual's likelihood or willingness to perform a specific habit or activity.

- **Adoption of Innovation:** The decision and process by which an individual utilizes a new product. In this study's context, adoption involves consumers opting to use biologics.

1.9 Biopharmaceuticals: Terms and Basic Concept

Biopharmaceuticals (biologics) are pharmaceutical products extracted from biological sources, including cell cultures, bacteria and yeast strains, or animal tissues and organs, and consist of complex macromolecules such as monoclonal antibodies, recombinant proteins, vaccines, and advanced therapy medicinal products (cell therapy gene therapies). Biologics, on the other hand, are structurally more complex than traditional small-molecule drugs and sensitive to manufacturing conditions, necessitating robust quality systems and cold-chain logistics.

This complexity underpins their clinical precision and, simultaneously, their regulatory and manufacturing challenges.

Classification and Examples.

- Monoclonal antibodies (most notably anti-inflammatory and more recently, anti-neoplastic agents)
- Recombinant therapeutic proteins (e.g. insulin analogues, growth factors and enzymes).
- There are two type of Vaccines : (prophylactic and therapeutic).
- These include but are not restricted to:• Advanced therapies (cellular and gene therapies) that cure rare and otherwise intractable diseases;

Sources and Manufacturing Overview.

Biologics are derived from modified cells (bacterial, yeast, or mammalian) Primary process steps consist of cell line development, upstream (fermentation/bioreactors) and downstream purification, formulation/fill-finish, and intensive release testing. Even minor changes in process parameters can change the quality characteristics of the product, and therefore stringent process controls along with comparability studies are required.

Objectives and Health-System Importance.

Biologics act on precise disease pathways, leading to higher success rates in oncology, autoimmune disorders, and rare illnesses. They help foster precision medicine, decrease the disease burden over time, and are in support of national medicine security and industrial development.

Drivers of Emergence and Diffusion. The worldwide acceleration of biotechnology technologies and international interest due to high-priority clinical unmet needs in the chronic/complex disease setting/conducive therapeutic (grade of evidence favoring superiority/targeted efficacy) have been key drivers contributing to this rise. Policy needs (e.g. Mascarenhas-Melo et al., 2024) also require production in the region for security of supply and local economic balance, so centrally generalizing the business case for hydroplane production by clustering Linux distributaries with resort to RISC processors.

Risk Profile and Challenges.

Challenges include but are not limited to immunogenicity (such as the potential for antidrug antibodies affecting safety/efficacy); risk of batch-to-batch variability due to

environmental changes and process sensitivity; manufacturing/supply-related risks (for example, facility/product capacity constraints, cold chain requirements); and affordability/coverage issues that could restrict equitable access. Lifecycle risk management is thus heavily reliant on pharmacovigilance and real-world evidence.

Multi-dimensional Considerations (KSA-relevant).

- Clinical dimension: impact on outcomes and quality of life.
- Economic dimension: budget impact, payer coverage, and cost-offset potential.
- Regulatory aspect : strict quality/CMC control and unambiguous replacement/switchover rules.
- Socio-cultural dimension: locally v/s imported, trust on institutions.
- Industrial/policy dimension: local capacity, workforce skills, and strategic drug security.

1.10 Factors Shaping Public Adoption of Locally Manufactured Biopharmaceuticals

This section consolidates the core determinants that condition public willingness to adopt LMBs in Saudi Arabia and motivates the study's hypotheses.

Awareness and Knowledge.

Public understanding of biologics—even the fact that they are essentially interchangeable with reference products—would help allay confusion and encourage positive attitudes. In conclusion, misconceptions about biosimilars (safety myths, generics) can slow down their adoption; therefore, they require focused education and transparent communication.

Trust (Product, Manufacturer, Regulator, Clinician).

There are several levels of trust at play: in the product quality, in GMP standards of local manufacturers, in SFDA as a national regulator and by physicians' prescriptions. Clear guidelines and uniform messaging make it more likely for people to view something as legitimate — or at least socially acceptable.

Prior Experience (Direct or Vicarious).

Familiarity with biologicals within the household or being exposed to them through friends increases comfortability and normalizes switching when clinically irreplaceable.

Vicarious experiences from media and patient groups also influence our social learning of success stories.

Economic Factors (Affordability, Coverage, Access).

In the original model, price sensitivity and insurance coverage, as well as availability, affect perceived behavioral control, with those who anticipate low out-of-pocket costs and associated quotes (3) and ready access more likely to intend use.

Socio-cultural and Communication Context.

Various cultural preferences (e.g., bias towards imported-brands), risk communication, and media narratives can either feed into or reduce acceptance. Key local messaging needs to focus on quality assurance, regulatory oversight, and clinical equipoise.

Connection between Hypotheses and Model.

In line with the Theory of Planned Behavior, attitudes are driven by awareness and experience, subjective norms are associated with trust, and perceived behavioral control

is mainly related to economic stressors. Collectively, these factors influence behavioral intention to adopt LMBs.

1.11 Theoretical Framework

Several theoretical models explain people's decision to adopt or reject novel medical interventions. One model used in this investigation is the Theory of Planned Behavior (TPB). According to Ajzen (2020), TPB postulates that a person's behavioral intent to engage in a specific action remains grounded on their attitude towards the habit, subjective norms, and overall perceived habitual control. Attitude involves a person's evaluation of using LMBs, influenced by knowledge and past experiences. Subjective norms reflect perceived social support or pressure, such as the recommendations of doctors. Perceived control encompasses the ease or difficulty of obtaining the product, which remains influenced by the product's access and its cost. Another valuable theoretical angle for this exploration comes from models focusing on risk and benefit perceptions, particularly the Health Belief Model (HBM). The framework highlights that a person's engagement in a health habit is a function of their overall perceived susceptibility to a specific problem, the related severity of the issue, the possible benefits, and potential barriers to taking the action (Alamer, 2024). The theory suggests that trust in the safety and efficacy of LMBs influences people's adoption.

Another model is social learning or cognitive theory. The model demonstrates that people's habits remain grounded in their past experiences and observing others, emphasizing the role of observational learning, self-regulation, and reinforcement (Islam et al., 2023). In the context of this investigation, previous experience with biologic medications can shape an individual's acceptance of new biologics. Self-efficacy is

another element introduced by this theory, which overlaps with the perceived control feature from TPB. The diffusion of innovations (DoI) and the technology acceptance model (TAM) are other valuable theoretical models for this study. The two theories, together with that of TPB, share a common strategy for explaining the overall user acceptance of a novel product, based on its value, correlation with one's values, and overall usability (Arora et al., 2023). DOI explains how innovations spread through social systems. When doing so, it emphasizes relative advantage, trialability, complexity, compatibility, and observability. For example, a strong endorsement of a particular biologic and subsequent inclusion in clinical guidelines can increase diffusion by augmenting legitimacy. TAM highlights perceived usefulness and ease of use. In the context of this exploration, if people perceive the biologic to have equal efficacy as the reference drug, this will lead to high acceptance and adoption. Ultimately, all these models suggest that awareness, trust, experience, and economic factors influence attitude, normative approval, and perceived control, which in turn determine behavioral intention.

When using the TPB model, its theoretical components remain mapped to the study variables as follows:

TPB Component	Operationalized Study Variable
Attitude	Level of knowledge, prior experience with biologic drugs
Subjective Norms	Trust in national regulatory bodies and societal perceptions
Perceived Control	Economic accessibility, availability of insurance coverage

Table 1-1 Mapping of TPB

Operationalizing the Constructs.

- Attitude—Informed by awareness/knowledge and past experience; positive evaluations of LMBs increase intention (efficacy, usability);
- Subjective norms → Constructed based on trust in regulators, clinicians, and the health system; perceived social/institutional approval increases intention to comply with a guideline.
- Perceived behavioral control → operationalized as economic access (affordability, insurance coverage, availability); higher perceived control leads to greater intention.

Complementary Theoretical Lenses.

HBM demonstrated that perceived benefits versus barriers (affordability, safety concerns) are the predominant barriers to risk knowledge acquisition, with physician recommendation serving as a cue for action.

- Social Cognitive Theory: self-efficacy/observational learning (prior/vicarious experience builds confidence to take on action)
- DoI/TAM empiric definition of diffusion via relative advantage, compatibility, complexity/ease-of-use and observability; these are strengthened through shared regulatory endorsement and clinical guideline inclusion. People perceived it as beneficial and legitimacy.

The derived Propositions aligning to H1–H4.

- H1: Greater awareness → more positive attitudes → greater intention.

- H2: Greater trust in product/manufacturer/regulator/physician → stronger subjective norms → higher intention
P1 exercised moderation over the relationship between independent and mediator variables; it consequently reached statistical significance.
- H3 : Direct/vicarious positive prior experience → enhanced attitudes/norms → higher intention.
- H4: Perceived affordability/coverage/availability having a direct effect on perceived behavioral control and indirectly affecting intention.

TPB Construct	Study Variable(s)	Primary Pathway
Attitude	Awareness & Prior Experience	Affects evaluation of LMBs → Intention
Subjective Norms	Trust (product, regulator, clinician)	Social/institutional approval → Intention
Perceived Behavioral Control	Economic Factors (price, insurance, availability)	Feasibility to obtain/use → Intention

Table 1-2 Construct

1.12 Conceptual Framework

The theoretical background of this study is based on the TPB model. According to the theory, behavioral intention (i.e., an individual's motivation or willingness to engage in a particular behavior) is determined by three related constructs: Attitudes towards the target behavior, Subjective norms, Perceived behavioral control (Ajzen, 2020). To make

this theory applicable to the issue of public acceptance for LMBs in Saudi Arabia, four crucial independent variables can be mapped with TPB constructs:

- Awareness and Knowledge: These measures an individual's orientation toward biologic products, which ultimately determines how favorably or unfavorably they feel about adopting related items.
- Trust in the reliability of the product and registration bodies: These issues parallel subjective norms, indicating perceived social and institutional influences on behavior.
- Previous Use of Biologic Medications: This condition affects attitudes and subjective norms by reducing uncertainty regarding perceived legitimacy.
- Economic factors (Price sensitivity and insurance coverage): These factors are related to perceived behavioral control, as they affect patients' perceptions of their ability to obtain or afford biologics.

Moreover, the model takes into account demographic variables. These include gender, age, education level, and employment sector. All these are possible moderators of behavioral intention. These elements may influence how people perceive or respond to independent variables. Figure 1.1 below illustrates the framework. Attitude toward LMBs is influenced through Awareness/knowledge and prior experience; Trust informs Subjective Norms (perceived professional/institutional endorsement); Economic factors inform Perceived Behavioral Control (affordability and access) Together, these three TPB constructs predict the behavioral intention to adopt LMBs. Demographic

characteristics (i.e., age, sex, education, and working status) are also considered as moderators that may extend pathways.

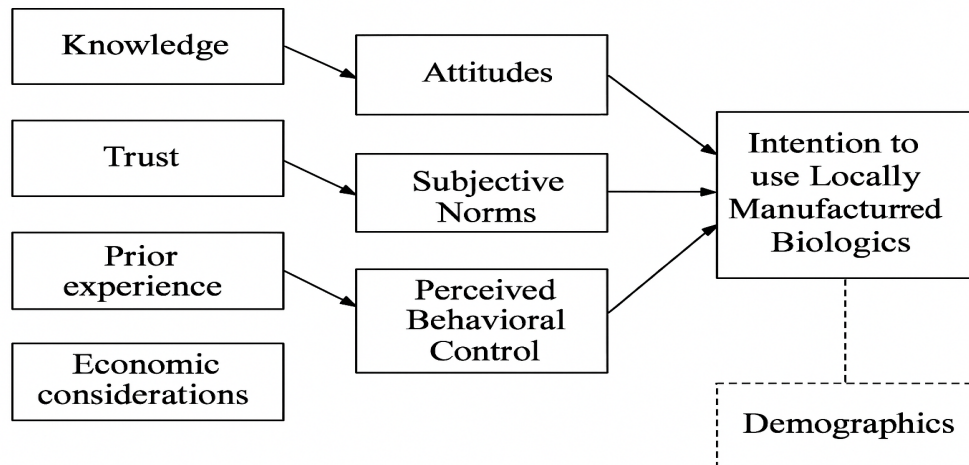


Figure 1-2 Conceptual model of the relationships between TPB constructs and public adoption intention toward LMBs.

1.13 Chapter Conclusion

This chapter established the study’s rationale and delimited its scope, then articulated core biopharmaceutical concepts, risk/benefit considerations, and the specific determinants of public adoption in the Saudi context. The expanded theoretical framework and the TPB-aligned conceptual model specify testable relationships among awareness, trust, prior experience, and economic factors in shaping behavioral intention. The next chapter systematically reviews global and local empirical evidence, highlights consistencies and gaps, and further justifies the study’s hypotheses and measurement.

Chapter Two: Literature Review

2.1 Introduction

This chapter outlines the scientific and theoretical background supporting this exploration. It enables one to comprehend how KSA citizens might adopt locally manufactured biopharmaceuticals (LMBs). The primary objective is to review and synthesize existing knowledge about the research's main concepts and variables, thereby identifying the prevailing research gap. It covers theoretical models, their integration into a framework, empirical findings, critique, a conceptual model, and research gaps. By the end of this section, it will be evident how this exploration develops from the interlink between existing literature and unmet needs in comprehending public adoption of LMBs.

2.2 Empirical Literature

2.2.1 Global Perspective

Recently, research on the adoption of biologics has grown. Several international studies have examined the public or patient perspectives on biological products. One of the recurring themes in global explorations of this area is the low public awareness of biosimilars. For example, a large U.S. investigation by (Gibofsky et al. 2023) demonstrated that 66 percent of patients had never encountered the term "biosimilar." In another study involving participants from North America and Europe, 25 to 58 percent reported that they did not have sufficient knowledge about these novel products (Wu et al., 2023). In Europe and the U.S., patient education campaigns recommend the increased

adoption of biological products supporting the same ideology. A 2023 survey within the European Union showed marked confusion among patients when considering biological products (Barbier et al., 2020). From this, one could infer that awareness in KSA is also low in a similar manner. Trust and use of LMBs are related to their perceived safety and efficacy.

A multinational systematic review by Rieger et al. (2024) indicated that trust-related issues are the most significant obstacles or enablers for biologics uptake. In particular, regulatory endorsement was a fundamental enabler. Products approved by the FDA and similar agencies have shown high adoption rates among patients and clinicians. Wu et al. (2023) conducted a thorough systematic review of patients' perceptions, noting that most clients harbor initial skepticism concerning biological efficacy and safety due to a lack of trust and awareness. Patient trust in adopting these products rises with a physician recommendation. However, one investigation found moderate acceptance of biological products among specialists, with most calling for distinct guidelines for their use (Omair et al., 2022). All these findings reveal that establishing trust via transparent communication and regulatory endorsements is valuable to increasing LMB adoption in KSA. Empirical evidence also suggests that prior exposure to biologics makes clients more receptive to similar products in the future. Patients with experience can switch between biological products due to various reasons, including convenience and tolerability issues; their acceptance level is also high (Mysler et al., 2021). The concept correlates with an increased willingness of almost 70%, which is associated with prior experience, as demonstrated by Wu et al. (2023). Experience can also be indirect. Patient

advocacy groups in Europe have shown that hearing about other patients' successes after using these products increases community acceptance (Rieger et al., 2024).

Diverse studies also portray the influence of cost and insurance on biosimilar adoption. A systematic review analyzing European and American data revealed that the cost-saving model of biosimilars has increased the availability of biological products and enhanced therapy (Kvien et al., 2025). Another systematic review by noted that the drop in out-of-pocket expenses is one of the most fundamental factors shaping patient behavior for medication choices. The concept is applicable where patients perceive that a product is as efficient as the reference drug. For example, within the U.S. context, higher copays for biologics lead to lower adherence, suggesting that a more affordable biological product would enhance adherence and uptake (Shubow et al., 2023)

2.2.2 Local Perspective

Research in the area within KSA is sparse. Almutairi et al. (2023) conducted an expert opinion survey within the KSA landscape, highlighting the need to establish trust and educate clinicians and patients about biosimilars. Within the upcoming decade, the piece indicates that KSA will experience a rapid increase in the use of LMBs. Qahtani et al. (2024) conducted a study focused on determining the perceptions of clinicians in KSA's health providers regarding the use of biological products, noting the need for consistent educational sessions to raise awareness and promote the adoption of LMBs in Saudi Arabia. Another study by Alanazi et al. (2024) revealed significant knowledge gaps and mixed views among clinicians regarding the long-term safety and efficacy of biological products and biosimilars. (Alanazi et al., 2024) offer a value framework including various recommendations for increasing the adoption of biological products in

the Gulf region, including in the KSA. Factors cited as causes of the low adoption of biologics included low awareness, a trend where doctors prefer familiar brands, and patients' cultural perceptions of imported drugs (Alanazi et al., 2024). Overall, this empirical literature suggests that the four independent variables of this study are the factors influencing the adoption of LMBs globally.

2.2.3 Thematic Classification of Studies

This subsection synthesizes the empirical literature along the core axes aligned with the present study's independent variables—awareness/knowledge, trust, prior experience, and economic factors—together with the behavioral intention outcome.

(A) Awareness & Knowledge

Global. Multiple studies consistently report low public familiarity with biosimilars/biologics, indicating substantial knowledge gaps that inhibit confident adoption (Barbier et al., 2020; Gibofsky et al., 2023; Wu et al., 2023). Patient education initiatives are therefore recurrently recommended to improve understanding and correct misconceptions.

Local. Evidence experts and providers in Saudi Arabia and the Gulf launched that could help knowledge size for available research conditions disparities varies at the blockchain(Alanazi et al., 2024; Almutairi et al., 2023; Qahtani et al., 2024) The implications are that public awareness approaches for KSA might have to be different, with country-specific concerns addressed.

(B) Trust & Institutional Endorsement

Global. Trust influenced Their views: evidence-based communication of results, regulatory approval, and physician endorsement improved acceptability (Rieger et al., 2024; Shubow et al., 2023).

Local. Saudi and regional sources emphasize confidence in the national regulator and explicit formal guidance as necessary for implementation, with stronger national directives and consistent messaging seen as facilitators (Almutairi et al., 2023; Qahtani et al., 2024).

(C) Previous Experience & Social Learning

Global. Prior personal and vicarious (e.g. peers outcomes) experience alters uncertainty and is associated with a higher propensity to initiate biologic therapies, as is the willingness to switch when clinically needed through observational learning and self-efficacy pathways (Mysler et al., 2021; Wu et al., 2023)

Local. Local studies on how exposure in inpatient/family practice affects the mindset of a future healthcare professional, but patient data regarding this and its influence on public perception is lacking(Alanazi et al., 2024; Almutairi et al., 2023).

(D) Economic Factors (Price, Insurance Coverage)

Global. The affordability and access are important associations for adherence, utilization, and overall uptake; there exists a possibility of broadening the availability where clinical equivalence is appreciated with savings from the use of these biosimilars (Kvien et al., 2025; Shubow et al., 2023).

Local. In Gulf settings, price sensitivity, payer policy, and procurement models are key

levers in the regional consensus framework, while drug security and local manufacturing should be topics of policy discourse within Saudi Arabia (Alnaqbi et al., 2025; Tawfik et al., 2022).

Behavioral Intention & Adoption Outcomes

In turn, intention loads onto attitudes, perceived norms, and perceived behavioral control across contexts aligning with these thematic axes, providing a cohesive theoretical foundation for the present model (Ajzen, 2020).

2.2.4 Cross-Study Similarities and Differences

Similarities across contexts

- Gaps in awareness are widespread and inversely associated with acceptance (Gibofsky et al.
- Trust, which includes health regulatory body and physician endorsement has been consistently linked to adoption intention (Rieger et al., 2024; Shubow et al., 2023).
- Prior experience (direct or vicarious) is linked to greater openness to biologics and therapeutic switching (Mysler et al., 2021; Wu et al., 2023).
- Affordability and insurance coverage materially affect access, adherence, and overall uptake (Kvien et al., 2025; Shubow et al., 2023).

Global evidence vs. KSA/GCC evidence

- **Population focus:** Global studies more likely include patient/public samples; Saudi/GCC work continues to be mostly provider-centric (Alanazi et al., 2024; Almutairi et al., 2023; Qahtani et al., 2024)
- **Cultural / economic context:** KSA / GCC: The dominant cultural preference (imported brand image) and procurement/coverage structures outweigh any other societal criteria.
- **Policy relevance:** National manufacturing and medicine-security goals(e.g., Mascarenhas-Melo et al., 2024) intersect with adoption debates in Saudi Arabia (Mascarenhas-Melo et al., 2024; Tawfik et al., 2022)

	Key global findings	Key KSA/GCC findings	Implication for present study
Awareness & Knowledge	Public awareness is low; education reduces barriers (Barbier et al., 2020; Gibofsky et al., 2023; Wu et al., 2023)	Low levels of understanding/awareness in practice, need for education (Alanazi et al., 2024; Almutairi et al., 2023; Qahtani et al., 2024)	Measure it properly and test if it increases intentionico systemFontSize.
Trust & Endorsement	Regulatory/physician endorsement drives uptake (Rieger et al.,	Trust in SFDA and clear national guidelines are key drivers (Almutairi et	Healthy skepticism: trust in product,

	2024; Shubow et al., 2023)	al., 2023; Qahtani et al., 2024)	manufacturer, regulator, clinician.
Prior Experience	Experience reduces uncertainty; increases willingness and switching (Mysler et al., 2021; Wu et al., 2023)	Prior experience is not measured at public-level	Scarce of evidence from cross-national study to capture direct/indirect prior exposure among the public.
Economic Factors	Cost/coverage drive access and adherence (Kvien et al., 2025;	Price sensitivity, payer policy, and procurement models are salient; local manufacturing tied to drug security (Alnaqbi et al., 2025; Tawfik et al., 2022)	Model affordability, insurance coverage and availability into perceived control
Behavioral Intention	Theory of Planned Behavior (TPB) constructs, Behavioral Intention align with adoption drivers(Ajzen, 2020)	—	Use TPB framing it poses the hypotheses and analysis structure

Table 2-1 Thematic synthesis of prior studies and implications for KSA

2.3 Critique of Existing Literature

Existing literature depicts numerous limitations. Most explorations conducted in KSA and the Gulf region engaged clinicians. None focused on acquiring the general public's opinions on biological products. End-user perceptions remain unexplored. Another unexamined aspect is the role of contextual and cultural influences on the decision to adopt biologics in KSA. Methodological issues include small, nonrepresentative samples and reliance on cross-sectional surveys. Most current literature analyzes a single variable in isolation. By doing so, they fail to determine how the four independent variables covered in this exploration influence behavioral intention to use LMBs in KSA. Finally, existing literature emphasizes cost-saving strategies while undermining psychological barriers impeding LMBs' adoption in Saudi Arabia.

2.4 Chapter Summary

The chapter synthesizes theory and evidence to support the investigation of public acceptance of LMBs. Reviewing various theoretical models revealed that awareness, social endorsement, perceived control, and prior experience shape intention. The existing empirical literature worldwide indicates a low level of public awareness of biological products. Most people rely on the trust and recommendations of physicians before adopting or using various medical products. Experienced patients or family members show a high willingness to adopt biological products. Costs and insurance coverage influence the availability and accessibility of LMBs, affecting their adoption and usage. Regional explorations reveal modest knowledge and attitudes among providers regarding the use of LMBs. Public data on attitudes and overall perceptions of using LMBs is lacking. Cultural factors might be valuable in shaping people's utilization of LMBs in

KSA. The conceptual framework incorporates all these insights and identifies demographic moderators. Therefore, the review sets the stage for a theory-driven investigation of adoption behavior.

2.5 Research Gap

Locally and internationally, there is a growing interest in biopharmaceutical localization. Within KSA, the correlation with Vision 2030 calls for efforts to support this initiative. However, no investigation has assessed the Saudi's public readiness to use LMBs. Prevailing research focuses on clinicians or small patient groups. As such, existing literature provides little to no valuable insights into the general public's attitudes on LMBs. The integrated implications of awareness, trust, experience, and economic factors remain uncovered in empirical studies within KSA. Cultural variances might influence these factors, indicating the need for regional research in this area. Most explorations in the area predate recent developments, particularly the pandemic, suggesting that they may not accurately reflect current views. Ultimately, this study will tackle this gap by adopting a comprehensive theoretical model to measure and analyze public adoption intentions on LMBs.

Chapter Three: Methodology and Research Procedures

3.1 Research Design

This study was a descriptive-analytical cross-sectional analysis of the attitudes of the Saudi population towards LOBs. Data were collected via a bilingual electronic survey targeting adults (≥ 18 years) living to the Kingdom. The online format of the survey enhanced accessibility; nevertheless, participation was restricted to individuals with internet access, potentially introducing bias about geographical and educational representation. We acknowledge that this presents a constraint regarding generalizability.

3.2 Study Population and Sampling

The study focused on the people who were 18 and older living in Saudi Arabia. A total of 400 people completed the survey. The sample was intentionally diversified, encompassing many demographic parameters (age, gender, level of education, and employment) in order to represent the population of Saudi Arabia.

3.3 Instrument for Data Collection

The data were collected using a bilingual (Arabic–English) questionnaire that was specifically

- designed for the current case. The subsequent elements were included:
- Socio-demographics (age, sex, education, occupation)
- Knowledge and cognizance of biologic drugs and their sources
- Regulatory authorities' credibility and the efficacy and safety of local biologic drugs
- Patient or family history of biologic use
- Variables that are economically based (including pricing, insurance status, and perceived product availability)
- Behavioural intention to use biologic medications at specific levels of conditions (e.g., as recommended by a physician or insured)

3.3.1 Skip Logic:

In order to enhance the relevance and respondent-friendliness of the questionnaire, skip logic was implemented by incorporating the respondents' self-reported awareness:

- Participants who responded with "I have good or general knowledge" were instructed to skip questions 6 through 10 and proceed directly to questions 11 and beyond.
- Questions six through eleven were introduced to respondents who responded with "I have not heard of it." They then proceeded to question 26, thereby avoiding the "advanced sections for those who are informed."

This logic maximized data quality and reduced survey fatigue by being responsive to the level of familiarity each respondent had with biologic drugs. were asked to continue to question 11 and beyond.

- Respondents who chose "I have not heard about it" were then presented with questions 6 to 11, and then jumped to question 26, avoiding more complex sections designed for informed participants.

This rationale reduced respondent burden and maximized data quality by customizing question flow based on an individual's knowledge of biologic drugs.

3.4 Reliability and Validity

The questionnaire underwent several quality control procedures to ensure methodological consistency and alignment with the study's theoretical framework.

An academic pharmacy expert in the field of pharmaceutical sciences and health policy reviewed the device for clarity, design, and contextual validity (Face & Content Validity).

Several revisions to improve clarity, neutrality, and alignment with the theoretical constructs were performed after review by an expert.

To ensure that the Arabic and English versions of the instrument were linguistically and culturally equivalent to each other, both iterations went through a process called back-translation to validate agreement between them (Wu et al., 2023).

This study did not perform formal statistical reliability testing, such as Cronbach's alpha. Different question formats (like descriptive items, skip-logic questions, or single-item constructs) were added to this end, which are less suitable for internal consistency analysis. This is consistent with the best practices in exploratory behavioral research for broadband, non-clinical samples based on multiple dimensions of constructs. Future research using further developed multi-item scales should conduct reliability tests to assess internal consistency.

3.5 Statistical Analysis

All data were analyzed statistically using the Jamovi software (version 2.3). Depending on the types of data collected and the research hypotheses, we applied them accordingly as follows:

We calculated descriptive statistics, including frequencies, percentages, and mean $\pm$ standard deviation (SD), to summarize participant demographics and key study variables.

We also used the Chi-square (χ^2) test to determine associations between categorical variables, such as region of residence, employment status, and insurance coverage.

Spearman rank-order correlation coefficient (ρ) was used to determine the degree of association between two ranked, ordinal, or not normally distributed variables, g., awareness, trust, and willingness to adopt local biologics.

To compare differences across more than two independent groups (age categories or levels of education), the Kruskal–Wallis H test was conducted.

For the inference on more than two independent groups for behavioral intention, the Mann-Whitney U test was used to compare differences between male and female respondents.

Furthermore, logistic regression analysis was performed to try to predict biologic drug adoption by awareness, trust, insurance coverage, and experience.

Statistical tests were performed at the 95% confidence level, and statistical significance was defined as $p < 0.05$.

3.6 Variables

The study is structured around the following key variables:

Independent (Explanatory) Variables:

These include:

- Knowledge – assessed through a self-reported question on familiarity with biologic drugs and skip logic to tailor the flow of questions.
- Trust in the product and regulatory authority – measured using Likert-scale items about trust in the quality of locally made biologic drugs and in the SFDA.
- Experience – (information about the past use of biologic drugs medicines by the patient or his/her family members)
- Price Susceptibility – assessed through agreement-level measures on affordability and financial worry.
- Insurance status – represented by the degree to which patients were willing to utilize biologic drugs if insured.

Dependent Variable:

Behavioral Intention to Use Local Biologic Drugs was recorded with the use of one direct Likert scale question assessing individuals' willingness or intention to use biologic drugs under some circumstances (e.g., being recommended by a physician, or if covered by insurance).

Control Variables:

Demographics (e.g. age, gender, education, occupation and health vs. non-health sector). These factors were used to stratify response and examined differences between subgroups with Mann-Whitney or Kruskal–Wallis tests.

Chapter 4: Results and Recommendations

4.1 Introduction

This chapter provides strategic interpretations, analyzes the study hypotheses, and presents the primary statistical findings. The objective of the research is to enhance comprehension of public perceptions of locally manufactured biologic drugs in Saudi Arabia, as influenced by the Theory of Planned Behavior (TPB).

4.1.1 Sample Demographics

Four hundred respondents completed the survey. Key demographic characteristics of the sample

include:

Age: 59% of respondents were between 25 and 44 years old (Figure 4.1).

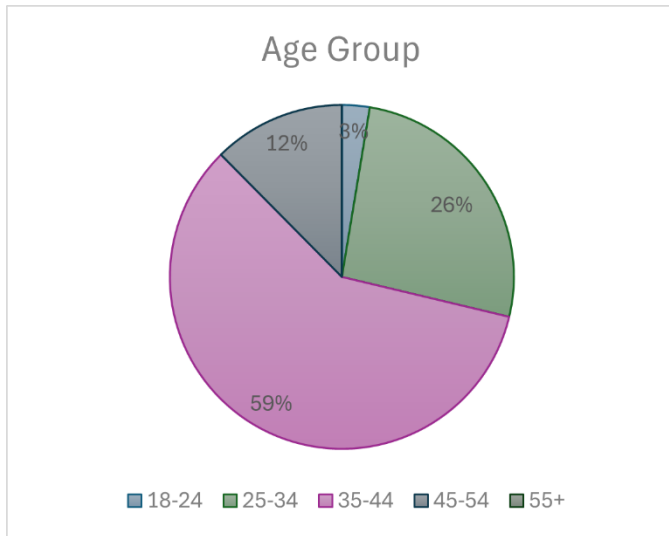


Figure 4-1: Age

Gender: 33% of respondents were female, while 67% were male (Figure 4.2).

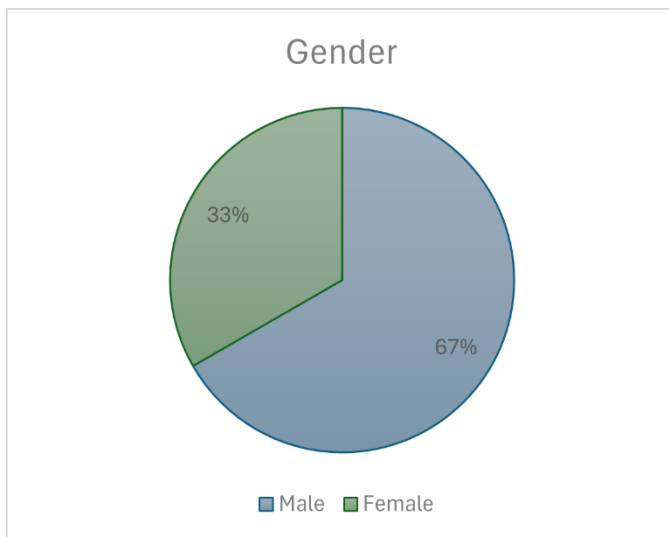


Figure 4-2: Gender

Education level: 87% of respondents held a bachelor's degree, and 9 % had high school education below the bachelor's level (Figure 4.3).

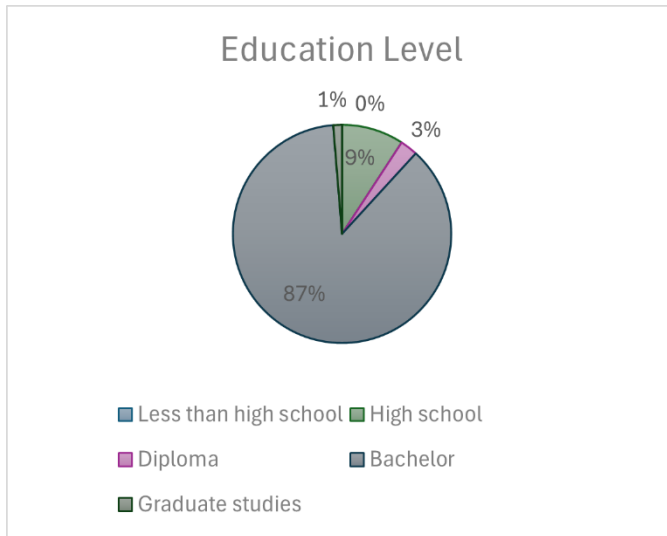


Figure 4-3: Education level

Employment Status: 63% of respondents were employed outside of health-related fields (Figure 4.4).

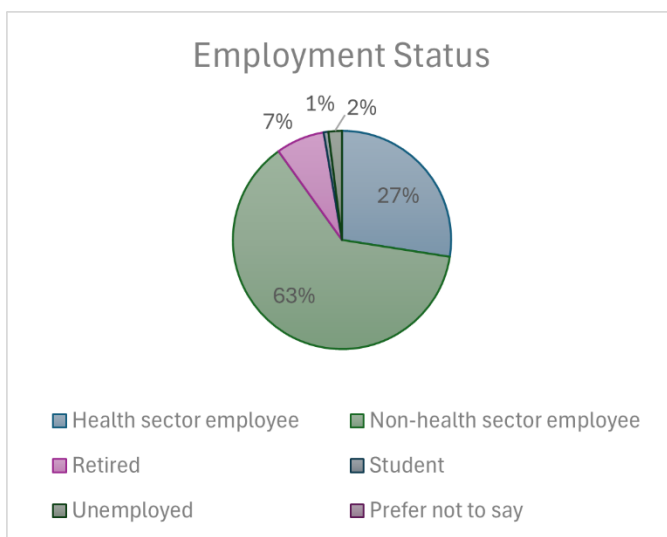


Figure 4-4: Employment Status

It is important to note that 63% of the sample reported employment in non-health sector other than the health sector. This suggests that the survey's findings are indicative of the general population's awareness, trust, and behavioral intention toward locally manufactured biologic drugs, as the majority of the responses are from individuals without a formal medical background.

4.1.2 Awareness of Biologic Drugs

The participants were asked whether they were aware of biologic drugs. Figure 4.5 shows that

69% had high knowledge, or some knowledge, and 31% never heard of biologic drugs.

This distribution is fundamental to give context of the first hypothesis (H1) related to whether the intention to use locally made biologic drugs is affected by level of awareness.

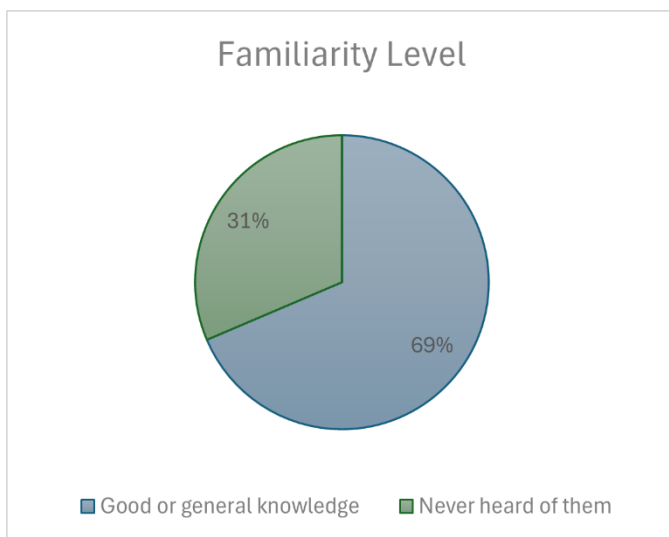


Figure 0-5: Familiarity level

4.2 Hypothesis Testing Results

Hypothesis 1: Awareness does not have an impact on readiness to adopt local biologic drugs.

The hypotheses have been checked through proper statistical techniques on the data, which belong to 400 respondents. We used Spearman correlation analysis and binary logistic regression to identify whether awareness (Q5) was related to readiness to adopt (Q22). A significant positive relationship exists between more awareness and an increase in adoption likelihood. The finding confirmed the TPB, mainly the attitude toward behavior, "awareness leads to a more positive intention towards hand hygiene," as described by this attitude.

Statistical Test	Value	p-value	Hypothesis Outcome
Spearman's Correlation	$\rho = 0.343$	$p < 0.001$	Rejected
Logistic Regression (OR)	OR = 1.30 [1.20 – 1.40]	$p < 0.001$	Rejected

Table 3: Summary of H1 Results

Hypothesis 2: Public acceptance is not influenced by trust in regulatory authorities or products.

Spearman's correlation and linear regression analysis were conducted to test this hypothesis. Willingness to accept (Q22), trust in product quality (Q14). A significant positive correlation was found between these two Behavioral intentions. Trust has a smaller inverse association with regulatory agency. This finding is in line with TPB's Perceived Behavioral Control and extends it by adding additional Attitudinal trust contributions, indicating that the firm's reputation per se does not necessarily suffice. However, rather confidence in the safety of the product plays a critical role.

Measure	Variable	Value	p-value	Hypothesis Outcome
Spearman's correlation	Q14 (Trust in Product) vs Q22 (Adoption)	0.356	< 0.001	Rejected
Logistic Regression (OR)	Trust Product	OR = 2.77 [1.91–4.01]	< 0.001	Rejected

Table 4: Summary of H2 Results

Hypothesis 3: Prior experience with biologic drugs is not associated with willingness to utilize locally produced forms.

Pearson's correlation test to examine the relationship between prior experience with biologic drugs (Q19) and the stated willingness to adopt locally produced biologic medications if fully covered by insurance (Q22). Individuals with prior exposure had stronger behavioral intentions, which may be because past experiences might have shaped personal attitudes. If possible, resonance to treatment outcomes of their loved ones resulted in a significant negative association between the two. This outcome rejects the null hypothesis, reaffirming that there is a positive influence of previous experience on adoption willingness. It is also in line with TPB, specifically the portion of Subjective Norms and Attitude towards the behavior, supporting that a first-hand experience with biologics contributes to an increased clarity of behavior (either through enhanced trust or well-informed trepidation).

Statistical Test	Variable Pair	Correlation (r)	p-value	Hypothesis Outcome
Pearson's Correlation	Q19 (Experience) × Q22 (Willingness)	-0.303	< 0.001	Rejected

Table 5: Summary of H3 Results

Hypothesis 4: Economic factors (e.g., price and insurance) do not significantly affect adoption.

The Spearman correlation and logistic regression tests were used to address this hypothesis. A significant negative correlation was found between price sensitivity (Q21_CostImportance) and intention to adopt local biologics without insurance coverage (Q22_UseIfInsured). Insured people are more likely to accept locally manufactured biologics (Q5); furthermore, the logistic regression model also showed that insurance familiarity is one of the significant factors in predicting intention to adopt. These results allow us to reject the null hypothesis. They seem to be staunchly pro-TPB (Theory of Planned Behaviour), specifically for the Perceived Behavioral Control one, but pointing out that having external enabling conditions such as affordability and insurance coverage do help quite a bit with behavioral intent.

Measure	Variable	Value	p-value	Direction / Interpretation	Hypothesis Outcome
Spearman's correlation Rho	Q21_CostImportance → Q22	r = -0.272	< 0.001	Higher cost concern → Lower intention to adopt	Rejected
Logistic Regression	Q5_Insurance Coverage → Q22	OR = 1.30	< 0.001	Insurance → Higher intention to adopt	Rejected

Table 6: Summary of H4 Results

Hypothesis 5: Awareness campaigns have no significant effect on public willingness to use local biologic drugs.

Spearman's correlation of campaign exposure with willingness to adopt local biologics was statistically significant and negative. This rejects the null hypothesis, indicating that current awareness campaigns may not just be working, but may have a perverse effect on adoption behaviour. This suggests potential problems with specific message framing, credibility, or channel effectiveness that could indicate the need for additional qualitative investigation to refine communication strategies.

Measure	Variable	Correlation (r)	p-value	Hypothesis Outcome
Spearman's correlation Rho	Campaigns vs Q22	0.341-	< 0.001	Rejected

Table 7: Summary of H5 Results

Hypothesis 6: No gender differences exist in the intention to use locally manufactured biologic drugs.

This hypothesis was tested using the Mann–Whitney U Test and the Independent Samples T-Test. The results showed statistically significant differences between males and females, with males expressing a stronger intention to adopt. This supports the importance of accounting for demographic factors in public health behavior models.

Test	U / t Value	p-value	Direction	Effect Size	Hypothesis Outcome
Mann–Whitney U	4927	< .001	Males > Females	Rank biserial = 0.359	Rejected
Independent Samples t	t(273) = 5.17	< .001	Males > Females	Cohen's d = 0.692	Rejected

Table 8: Summary of H6 Results

4.3 Strategic Behavioral Insights

4.3.1 Strategic Insights

Beyond the quantitative findings, this section interprets data from a TPB perspective regarding associated behavioural and strategic implications. Considering the Theory of Planned Behavior when interpreting these findings may shed light on the readiness of the Saudi population to use domestically produced biologic drugs.

Conclusions: Strong perception against herbal medicine was significantly influenced by readiness and young age, but did not convert into behavioral intentions, which reflects a knowledge-based appropriate frame of mind among the educated Saudi Arabian population. This coincides with the continued public health literacy work carried out by national entities. Trust in product quality proved to be more predictive than trust in the institution, finding that whilst bodies like SFDA are trusted, the public will still use the extent of perceived basic product reliability and clinical safety as a standard to gauge their adoption. An example of this practical and simple logic can be taken from the consumer who is deciding on healthcare. The lack of relationship between exposure to awareness campaigns and intention suggests a need to reconsider the framing of these awareness campaigns. Message strategies should not just concern general awareness but also emotional appeal, cultural sensitivity, and professional endorsements by healthcare providers, and providers may be more beneficial in the Saudi context. Ensuring economic factors featured strongly in behavioural intention, which aligns well with regional healthcare payment mechanisms that are likely to rest on largely employer-based or government-sponsored insurance defense. It is a disturbing finding to policymakers who will realize that affordability and coverage are both barriers as well as enablers. Lastly, the finding of a differential preference by sex such that males had higher odds of saying they would be ready to adopt deserves further social-cultural investigation. This can be due to variations in the access to health information, prevailing dynamics of household

decision-making, or even the perception of risk. These behavioral insights are essential for intervention programming.

4.3.2 Summary Tables

The following tables summarize the hypotheses tested and how they align with existing literature.

Hypothesis Code	Hypothesis Statement	Result	Supported by
H1	Awareness does not impact readiness	Rejected	Spearman's Correlation + Logistic Regression
H2	Trust does not affect public acceptance	Rejected	Spearman's Correlation + Logistic Regression
H3	Prior experience has no association with willingness	Rejected	Pearson's Correlation
H4	Economic factors do not affect adoption	Rejected	Spearman's Correlation + Logistic Regression
H5	Awareness campaigns have no significant effect	Rejected	Spearman's Correlation
H6	No gender differences in intention	Rejected	Mann–Whitney + Independent Samples T-Test

Table 9: Summary of Hypotheses and Their Outcomes

Study Reference	Key Finding	Alignment with This Study
(17)	Public trust in biosimilars is influenced by knowledge and physician input	Aligned with H1 and H2
(12)	Generic drug adoption affected by cost and prior experience	Aligned with H3 and H4
(18)	Low campaign efficacy in shifting perceptions	Supports H5 result
(19)	Gender disparities in health adoption behaviors	Aligned with H6
(9)	Behavior influenced by attitudes, norms, and perceived control	Framework for entire hypothesis set

Table 10: Comparison with Previous Studies

4.4 Recommendations

Based on the findings of this study, several strategic recommendations can be proposed to enhance public acceptance and behavioral adoption of locally manufactured biologic drugs in Saudi Arabia. These recommendations are structured across policy, communication, and regulatory dimensions:

1. Enhancing Public Awareness Through Targeted Education

While general awareness alone did not fully translate into behavioral adoption, findings suggest that participants with prior experience or deeper familiarity had higher intention scores. Therefore, public education campaigns should:

- Be tailored to address specific misconceptions about biologic drugs, particularly biosimilars and innovative therapies.
- Incorporate patient narratives and testimonials to create emotional relevance and build trust.
- Leverage digital platforms, such as the Sehhaty and Tawakkalna apps, to disseminate structured
- knowledge modules target both patients and healthcare providers.

2. Strengthening Trust via Transparent Quality Assurance

Trust in product quality was a significant determinant of acceptance. Thus, the SFDA and local manufacturers should:

- Publicly communicate clinical data, manufacturing standards, and post-marketing surveillance outcomes.
- Develop a “Saudi Biologic drugs Quality Seal” to certify locally manufactured biologic drugs that meet global GMP and ICH Q5E/Q6B standards.
- Collaborate with healthcare professionals to serve as trusted mediators in building confidence in local biologic drugs.

3. Improving Economic Accessibility and Insurance Coverage

Economic factors including insurance played a critical role in shaping behavioral intention. Recommendations include:

- Encourage the Council of Cooperative Health Insurance (CCHI) to mandate coverage of SFDA approved local biologic drugs under standard insurance plans.
- Offer subsidy programs or tiered pricing strategies for low-income populations to remove economic barriers to adoption.
- Highlight the long-term economic benefits of local biologic drugs to public and private insurers through pharmacoeconomic studies.

4. Reframing Awareness Campaigns

Campaign exposure showed either no or negative influence on willingness to adopt, indicating ineffective message design. Therefore:

- Campaigns should move beyond generic awareness to focus on behavioral nudges, such as social proof and perceived risk reduction.
- Use trusted community figures (e.g., physicians, pharmacists, local influencers) to deliver messages instead of broad institutional branding.
- Incorporate behavioral science techniques, such as framing effects, to reshape public perception.

5. Integrating Gender-Responsive Health Communication

The observed gender difference in intention necessitates nuanced communication strategies:

- Design women-focused awareness programs that address safety concerns, maternal health implications, and family-related decision-making.
- Partner with women's health clinics and maternal care centers to introduce information about biologic drugs during relevant medical visits.

6. Policy Alignment with Vision 2030

In alignment with Saudi Arabia's Vision 2030 and the National Industrial Development and

Logistics Program (NIDLP):

- Establish a National Adoption Index to monitor public trust and usage of locally produced biologic drugs.
- Encourage public hospitals and healthcare clusters to prioritize the prescription of local biologic drugs where clinically appropriate.

Reference:

1. Almutairi AR et al. The landscape of biosimilars in Saudi Arabia. *Expert Opin Biol Ther.* 2023;23(8):679–88.
2. Alshehri S et al. Current and future prospective of pharmaceutical manufacturing in Saudi Arabia. *Saudi Pharm J.* 2023;31(4):605–16.
3. Kim H et al. The future of biosimilars in immune-mediated diseases. *Drugs.* 2020;80(2):99–113.
4. Mascarenhas-Melo F et al. Overview of biosimilars—Development, regulatory issues, and healthcare management. *Pharmaceuticals.* 2024;17(2):235.
5. Alqawasmeh KA et al. Facilitators and barriers to generic and biosimilar medications in MENA. *Eur J Clin Pharmacol.* 2025;
6. Rieger C et al. Barriers and enablers for biosimilar uptake: A systematic review. *BioDrugs.* 2024;38(6):541–55.
7. Wu Q et al. Patients’ perceptions of biosimilars: A systematic review. *BioDrugs.* 2023;37(6):829–41.
8. Kim JEC, Kranzler EC, Yu K, Denison B, Dahlen HM, Luchman JN, et al. The Association Between the We Can Do This Campaign and Vaccination Beliefs in the United States, January 2021–March 2022. *J Health Commun [Internet].* 2024 Aug 2 [cited 2025 July 28];29(8):502–13. Available from: <https://www.tandfonline.com/doi/full/10.1080/10810730.2024.2373159>
9. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process.* 1991;50(2):179–211.
10. Leonard E et al. Healthcare provider knowledge and acceptance of biosimilars: A systematic review. *J Manag Care Spec Pharm.* 2019;25(1):102–12.
11. Ly R, Ly B. Unraveling the dynamics of online learning engagement: a Cambodian perspective. *Educ Res Policy Pract [Internet].* 2025 July 16 [cited 2025 July 17]; Available from: <https://link.springer.com/10.1007/s10671-025-09401-1>
12. Akhtar MS and O K. Evaluation of public’s knowledge, attitude and experiences towards the generic medications in building healthcare policy. *PLoS ONE.* 2024;19(11).
13. Sani NM et al. Pharmacists’ perspectives of biosimilars: A systematic review. *BioDrugs.* 2022;36(4):489–508.
14. Alnaqbi KA et al. Expert consensus on a biosimilars value framework for the Gulf. *Ther Innov Regul Sci.* 2024;

15. Cazap E et al. Global acceptance of biosimilars. *The Oncologist*. 2018;23(10):1188–98.
16. Barbier L et al. European stakeholder learnings regarding biosimilars. *BioDrugs*. 2020;34(6):783–96.
17. Almalki ZS et al. Physicians’ Knowledge and Awareness about Biosimilars in Saudi Arabia. *J Young Pharm*. 2020;12(3):280–4.
18. Omair MA et al. Perception of biosimilar biologics and non-medical prescription switching among rheumatologists. *Saudi Pharm J*. 2022;30(1):39–44.
19. Alqahtani M et al. Perceptions of biosimilars among healthcare providers in Saudi Arabia. *Innov Pharm*. 2024;15(4):2.

Appendix

Annex (A): Variable Coding and Analytical Structure

This appendix presents a comprehensive overview of the key variables used in the study, including their corresponding survey items, coding methodology, and their function in the statistical models. This structure ensured consistency in hypothesis testing and interpretation across both descriptive and inferential analyses.

Variable Code	Survey Question	Type	Values / Coding	Analytical Use	Comments
Q1	Age group	Categorical	1 = 18–24 2 = 25–34 3 = 35–44 4 = 45–54 5 = 55+	Control (Subgroup analysis)	Used for demographic profiling and age-based Kruskal–Wallis testing
Q2	Gender	Binary	1 = Male 2 = Female	H6 (Gender difference in intention)	Used in Mann–Whitney U Test for gender impact
Q5	Knowledge level of biologic drugs	Ordinal	1 = Good 2 = General 3 = None	H1 (Awareness impact)	Re-coded for familiarity binary logistic regression
Q15	Trust in local biologic drug quality	Ordinal (Likert)	1 = No trust at all → 5 = Strong trust	H2 (Trust-impact correlation)	Used in Spearman’s correlation
Q16	Willingness to use biologic if prescribed by doctor	Ordinal (Likert)	1 = Strongly disagree → 5 = Strongly agree	Dependent (Adoption readiness)	Main dependent variable across hypotheses
Q19	Exposure to awareness campaigns	Discrete	0 = Never 1 = Once 2 = Multiple 3+ = Repeatedly	H5 (Effectiveness of campaigns)	Correlation used to assess campaign influence
Q21	Importance of cost or insurance	Ordinal (Likert)	1 = Strongly disagree → 5 = Strongly agree	H4 (Economic factor)	Combined with Q5 in regression modeling
Q22	Willingness to use if covered by insurance	Ordinal → Binary	Original: 1–5 Recoded: 1–3 = 0 (Low), 4–5 = 1 (High intention)	Dependent (Binary for logistic regression)	Main adoption intention variable (used in H1–H4)

Annex (B): Public Survey Instrument

استبيان: A Questionnaire on the Public Adoption of Locally Manufactured Biologic Drugs in Saudi Arabia

استبيان حول اعتماد الأدوية البيولوجية المصنّعة محلياً في المملكة العربية السعودية

المعلومات الأساسية / General Information

1. **Age group / الفئة العمرية:**

- ☐ 18–24
- ☐ 25–34
- ☐ 35–44
- ☐ 45–54
- ☐ 55+

2. **Gender / الجنس:**

- ☐ Male / ذكر
- ☐ Female / أنثى
- ☐ Prefer not to say / أفضل عدم الإفصاح

3. **Education level / المستوى التعليمي:**

- ☐ Less than high school (Elementary or Intermediate) / أقل من المرحلة الثانوية (ابتدائي أو متوسط)
- ☐ High school / ثانوي
- ☐ Diploma after high school / دبلوم بعد الثانوية
- ☐ Bachelor / بكالوريوس
- ☐ Graduate studies or equivalent / دراسات عليا أو ما يعادلها

4. **Employment status / الحالة الوظيفية:**

- ☐ Health sector employee / موظف قطاع صحي
- ☐ Non-health sector employee / موظف قطاع غير صحي
- ☐ Retired / متقاعد
- ☐ Student / طالب
- ☐ Unemployed / غير موظف
- ☐ Prefer not to say / أفضل عدم الإفصاح

5. **How familiar are you with biologic drugs? / ما مدى معرفتك بالأدوية البيولوجية؟**

- ☐ I have good knowledge / لدي معرفة جيدة
- ☐ I have a general idea / لدي معرفة عامة لكن لا أعرف التفاصيل
- ☐ I have never heard of them / لم أسمع بها من قبل

Note:

- If the answer is "good knowledge," → skip to Question 12.
- If the answer is "general idea" or "never heard," → answer Questions 6–11, then skip to Question 24.

الوعي والانطباع / Awareness & Perception

6. Have you ever seen or heard the term "biologic drug" from any of these sources?
ما مدى تكرار معرفتك بمصطلح "دواء بيولوجي" من كل مصدر؟
(اختر عدد المرات أو حدد الوسيلة)
7. What do you think about the idea of drugs made using living cells or biological components?
أعتقد أن الأدوية البيولوجية المصنعة باستخدام خلايا حية فعالة وآمنة
☐ Strongly agree / أوافق بشدة
☐ Agree / أوافق
☐ Neutral / محايد
☐ Disagree / لا أوافق
☐ Strongly disagree / لا أوافق بشدة
8. If a local biologic drug has the same efficacy and safety as an imported one, would you try it?
أنا مستعد لاستخدام دواء بيولوجي محلي إذا أثبتت فعاليته وسلامته
☐ Strongly agree / أوافق بشدة
☐ Agree / أوافق
☐ Neutral / محايد
☐ Disagree / لا أوافق
☐ Strongly disagree / لا أوافق بشدة
9. What is the most important factor for you when choosing a drug?
ما مدى أهمية كل عامل من العوامل التالية عند اختيارك لدواء ما؟
(مقياس من 1 = غير مهم إطلاقاً إلى 5 = مهم جداً)
10. What is your preferred way to learn more about biologic drugs?
ما مدى فاعلية كل وسيلة من الوسائل التالية بالنسبة لك في التعرف على الأدوية البيولوجية؟
(اختر درجة من 1 = غير فعالة إطلاقاً إلى 5 = فعالة جداً)
11. Please indicate your agreement with the following statement:
أنا على علم أن الأدوية مثل الإنسولين، مونجارو، هوميرا، كليكسان، والتيليز، كلها تُصنّف كـ "أدوية بيولوجية". تطويرها محلياً يعزز الأمن الدوائي.
☐ Strongly agree / أوافق بشدة

- ☐ Agree / أوافق
- ☐ Neutral / محايد
- ☐ Disagree / لا أوافق
- ☐ Strongly disagree / لا أوافق بشدة

التجربة مع الأدوية البيولوجية / Experience with Biologics

12. Have you ever used a biologic drug?

هل سبق لك استخدام دواء بيولوجي؟

- ☐ Yes, currently using / نعم، أستخدمه حاليًا
- ☐ Yes, used in the past / نعم، استخدمته سابقًا
- ☐ No / لا
- ☐ Not sure / غير متأكد

13. Does someone in your household use biologic drugs?

هل يستخدم أحد أفراد عائلتك دواء بيولوجي؟

- ☐ Yes / نعم
- ☐ No / لا
- ☐ Not sure / غير متأكد

14. Are you aware that Saudi Arabia manufactures biologic drugs?

أنا على علم بأن المملكة العربية السعودية تصنع أدوية بيولوجية.

- ☐ Strongly agree / أوافق بشدة
- ☐ Agree / أوافق
- ☐ Neutral / محايد
- ☐ Disagree / لا أوافق
- ☐ Strongly disagree / لا أوافق بشدة

15. Do you believe Saudi biologics meet international standards?

أثق أن الأدوية البيولوجية المصنعة محليًا مطابقة للمعايير الدولية.

- ☐ Strongly agree / أوافق بشدة
- ☐ Agree / أوافق
- ☐ Neutral / محايد
- ☐ Disagree / لا أوافق
- ☐ Strongly disagree / لا أوافق بشدة

الثقة والاستعداد لاستخدام الأدوية البيولوجية / Trust & Willingness to Use

16. Would you use a Saudi biologic if prescribed by a physician?

سأستخدم دواءً بيولوجيًا سعوديًّا إذا وصفه لي الطبيب.

- ☐ Strongly agree / أوافق بشدة

- ☐ Agree / أوافق
- ☐ Neutral / محايد
- ☐ Disagree / لا أوافق
- ☐ Strongly disagree / لا أوافق بشدة

17. What is your main concern when using a biologic drug?

ما مدى قلقك من كل من العوامل التالية عند استخدام دواء بيولوجي؟
(اختر من 1 = لا يقلقني إطلاقاً إلى 5 = يقلقني بشدة)

- Side effects / الآثار الجانبية
- Lack of information / نقص المعلومات
- Cost / التكلفة
- Local quality / جودة المنتج المحلي
- Insurance coverage / التغطية التأمينية

18. What factors would increase your willingness to use Saudi biologics?

ما مدى تأثير كل من العوامل التالية على استعدادك لاستخدام دواء بيولوجي محلي؟
(اختر من 1 = لا يؤثر إطلاقاً إلى 5 = يؤثر بشدة)

- Doctor's recommendation / توصية الطبيب
- Insurance coverage / تغطية التأمين
- Government campaign / حملة توعوية من الجهات الرسمية
- Patient success stories / قصص نجاح من المرضى
- Price reduction / انخفاض السعر

19. Have you seen a Saudi campaign for biologics in the past year?

كم مرة رأيت حملة سعودية عن الأدوية البيولوجية خلال العام الماضي؟

- ☐ 0 = Never / لم أرها
- ☐ 1 = Once / مرة واحدة
- ☐ 2 = 2–3 times / مرتين إلى ثلاث
- ☐ 3 = 4+ times / أربع مرات أو أكثر

السعر والتأمين والتوفر / Cost & Accessibility

20. How important is the cost of medication in your treatment decisions?

ما مدى أهمية تكلفة الدواء في قراراتك العلاجية؟

- ☐ Very important / مهم جداً
- ☐ Important / مهم

- ☐ Neutral / محايد
- ☐ Not important / غير مهم
- ☐ Not important at all / غير مهم إطلاقاً

21. Would you accept a locally manufactured biologic drug if it is fully covered by insurance?

سأقبل باستخدام دواء بيولوجي محلي إذا كان مغطى تأمينياً بالكامل.

- ☐ Strongly agree / أوافق بشدة
- ☐ Agree / أوافق
- ☐ Neutral / محايد
- ☐ Disagree / لا أوافق
- ☐ Strongly disagree / لا أوافق بشدة

22. Have you ever faced challenges in accessing biologic drugs (e.g., not available in nearby pharmacies, not covered by insurance, delays in supply)?

هل واجهت سابقاً صعوبات في الحصول على الأدوية البيولوجية؟

- ☐ 1 = Never / لم أواجه صعوبات أبداً
- ☐ 2 = Minor difficulties / صعوبات بسيطة
- ☐ 3 = Moderate difficulties / صعوبات متوسطة
- ☐ 4 = Significant difficulties / صعوبات كبيرة
- ☐ 5 = Severe difficulties / صعوبات شديدة جداً

23. In your opinion, what actions should be prioritized to make biologics more accessible and affordable?

ما مدى أهمية كل من الإجراءات التالية لتحسين الوصول إلى الأدوية البيولوجية وخفض تكلفتها؟
(اختر من 1 = غير مهم إطلاقاً إلى 5 = مهم جداً)

- Increase public education / زيادة التوعية العامة
- Expand insurance coverage / توسيع التغطية التأمينية
- Local production incentives / تحفيز التصنيع المحلي
- Improve pharmacy availability / تحسين توفرها في الصيدليات
- Accelerate regulatory approval / تسريع الموافقات التنظيمية

Final Comments & Suggestions / التعليقات والاقتراحات النهائية

24. Do you have any final comments or suggestions?

هل لديك أي تعليق أو اقتراح آخر؟

- ☐ Open-ended response / إجابة مفتوحة

Annex (C): Statistical analysis by Jamovi software

Result

s

Descriptive

ptives

Descriptives

	Q1_Age	Q2_Gender	Q3_Education	Q4_Employment	Q22_UselInsured
N	400	400	400	400	275
Missing	0	0	0	0	125
Mean	2.79	1.67	1.28	1.85	2.31
Median	3.00	2.00	1.00	2.00	2
Standard deviation	0.665	0.472	0.833	0.693	1.43
Minimum	1	1	1	1	1
Maximum	4	2	4	5	5

Frequencies

Frequencies of Q1_Age

Q1_Age	Counts	% of Total	Cumulative %
1	10	2.5%	2.5%
2	109	27.3%	29.8%
3	236	59.0%	88.8%
4	45	11.3%	100.0%

Frequencies of Q2_Gender

Q2_Gender	Counts	% of Total	Cumulative %
1	133	33.3%	33.3%

2	267	66.8%	100.0%
----------	-----	-------	--------

Frequencies of Q3_Education

Q3_Education	Counts	% of Total	Cumulative %
1	354	88.5%	88.5%
2	10	2.5%	91.0%
3	5	1.3%	92.3%
4	31	7.8%	100.0%

Frequencies of Q4_Employment

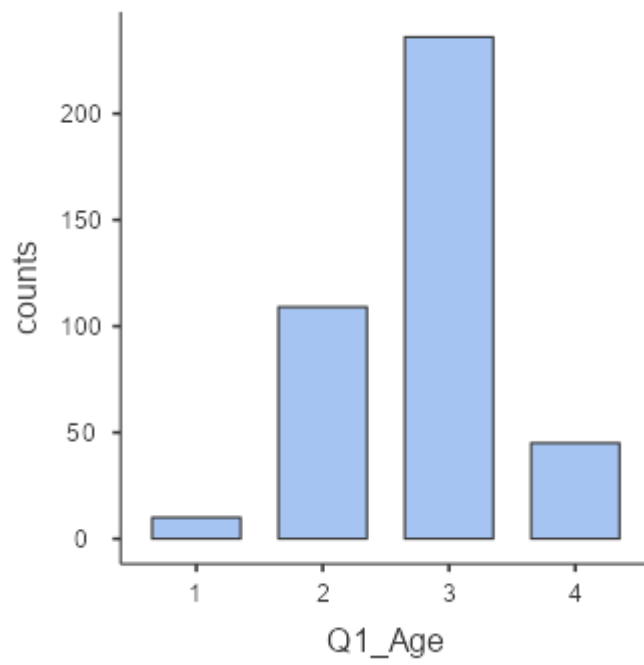
Q4_Employment	Counts	% of Total	Cumulative %
1	111	27.8%	27.8%
2	253	63.2%	91.0%
3	28	7.0%	98.0%
4	2	0.5%	98.5%
5	6	1.5%	100.0%

Frequencies of Q22_UselInsured

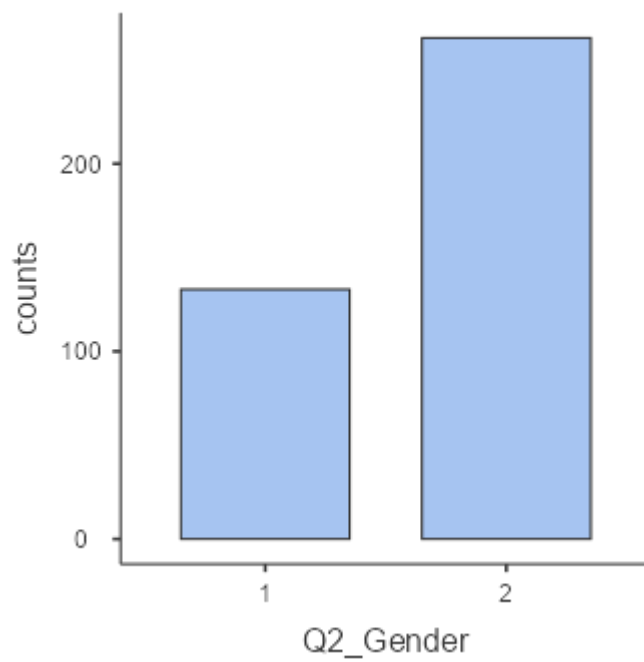
Q22_UselInsured	Counts	% of Total	Cumulative %
1	135	49.1%	49.1%
2	14	5.1%	54.2%
3	54	19.6%	73.8%
4	50	18.2%	92.0%
5	22	8.0%	100.0%

Plots

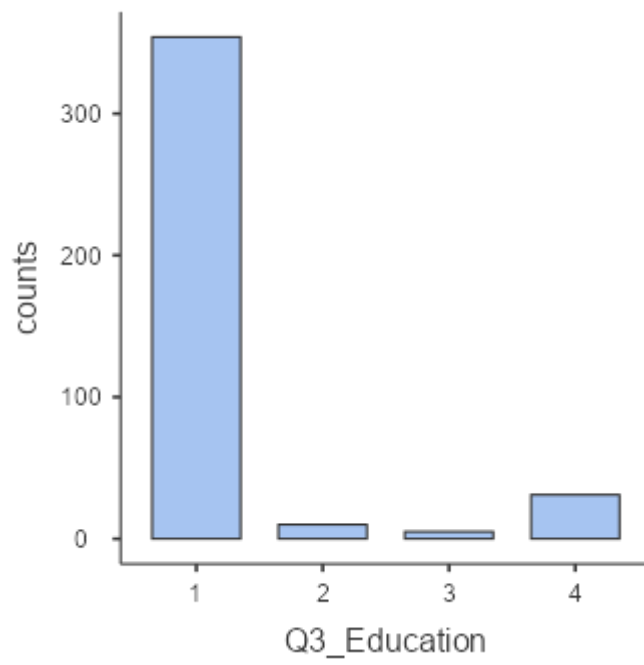
Q1_Age



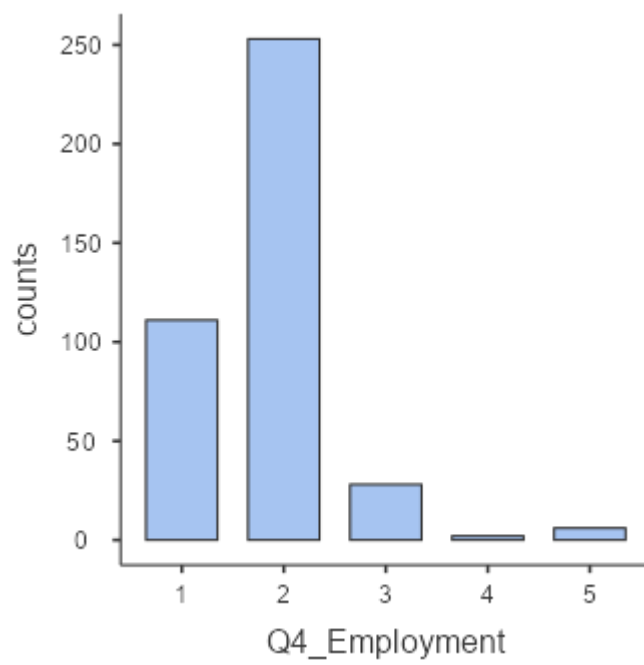
Q2_Gender



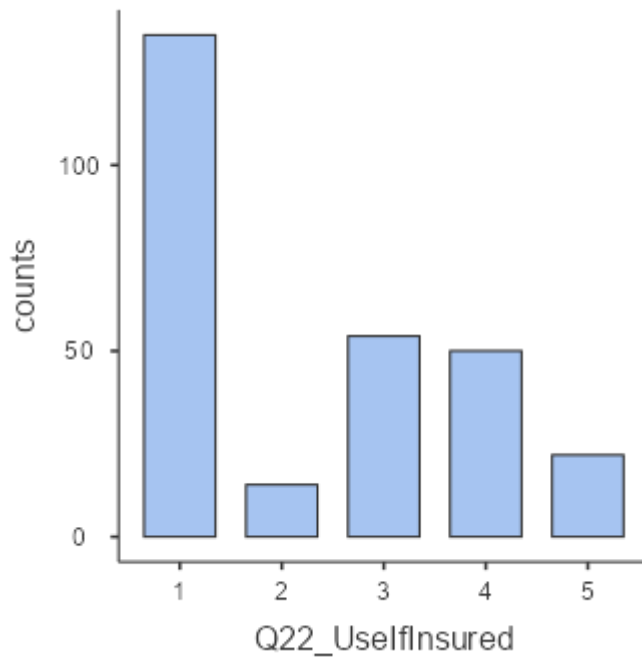
Q3_Education



Q4_Employment



Q22_UselInsured



Refer ences

- [1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.
- [2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

Results

One-Way ANOVA (Non-parametric) Age

Kruskal-Wallis

	χ^2	df	p	ϵ^2
Q22_UselInsured	25.8	3	<.001	0.0943

Dwass-Steel-Critchlow-Fligner pairwise comparisons

Pairwise comparisons - Q22_UselInsured

		W	p
1	2	-0.493	0.986
1	3	-3.125	0.121
1	4	-1.667	0.641
2	3	-6.733	<.001
2	4	-0.699	0.960
3	4	2.876	0.176

One-Way ANOVA (Non-parametric) Education

Kruskal-Wallis

	χ^2	df	p	ϵ^2
Q22_UselInsured	7.38	3	0.061	0.0269

Dwass-Steel-Critchlow-Fligner pairwise comparisons

Pairwise comparisons - Q22_UselInsured

		W	p
1	2	2.523	0.281
1	3	1.227	0.822
1	4	2.729	0.216
2	3	-1.386	0.761
2	4	-1.038	0.884
3	4	0.491	0.986

References

- [1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.

[2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

Results

Independent Samples T-Test : Gender

Independent Samples T-Test

						95% Confidence Interval		
						Effect Size	Lower	Upper
		Statistic	df	p				
Q22_UselInsured	Student's t	5.17	273	<.001	Cohen's d	0.692	0.423	0.960
	Mann-Whitney U	4927		<.001	Rank biserial correlation	-0.359		

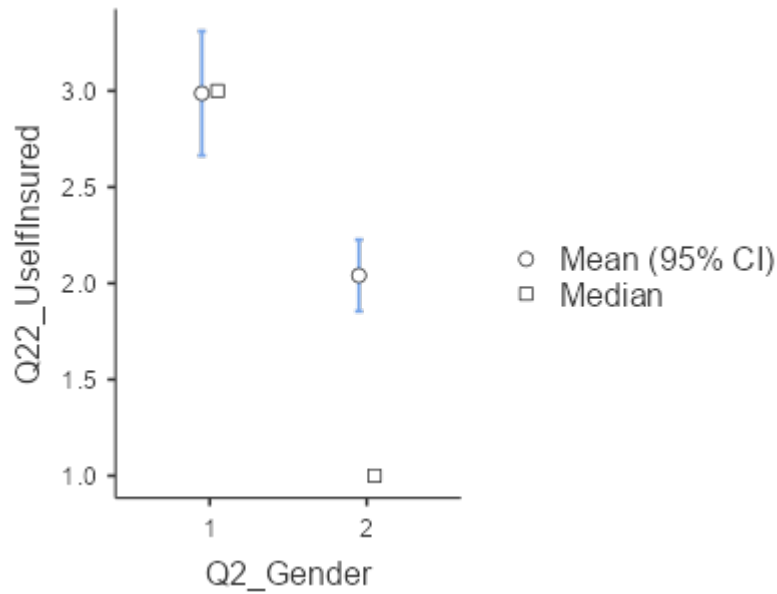
Note. $H_a \mu_1 \neq \mu_2$

Group Descriptives

	Group	N	Mean	Median	SD	SE
Q22_UselInsured	1	78	2.99	3.00	1.45	0.165
	2	197	2.04	1.00	1.33	0.0949

Plots

Q22_UselInsured



References

- [1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.
- [2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).
- [3] Kerby, D. S. (2014). The simple difference formula: An approach to teaching nonparametric correlation. *Comprehensive Psychology*, 3, 2165–2228.

Results Contingency Tables

Contingency Tables

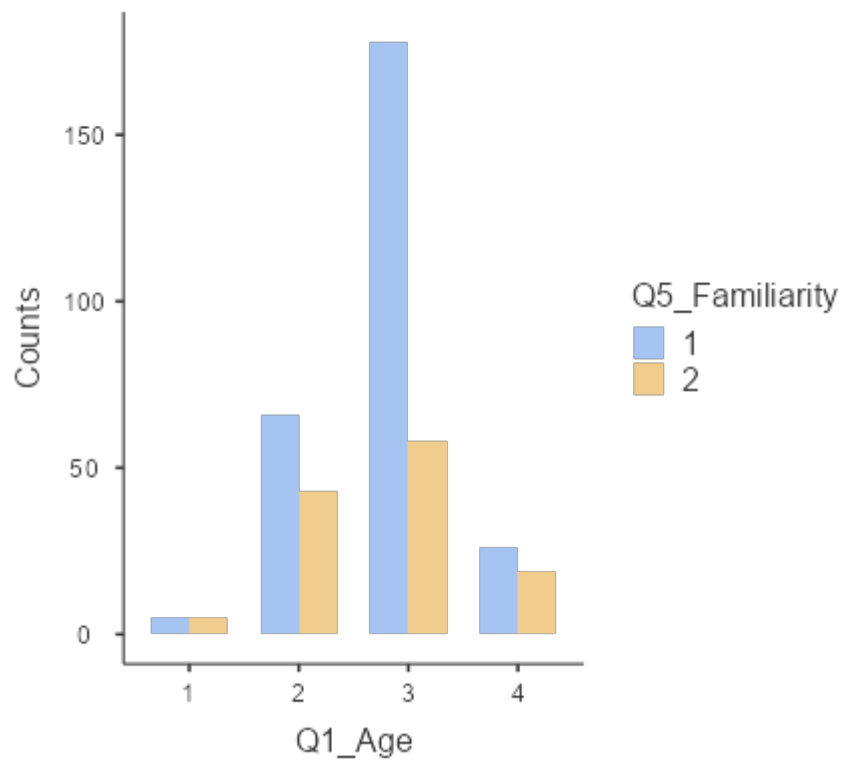
Q1_Age	Q5_Familiarity		Total
	1	2	
1	5	5	10
2	66	43	109
3	178	58	236
4	26	19	45
Total	275	125	400

χ^2 Tests

Value	df	p
-------	----	---

χ^2	12.5	3	0.006
χ^2 continuity correction	12.5	3	0.006
Likelihood ratio	12.3	3	0.006
Fisher's exact test			0.005
N	400		

Plots



Contingency Tables

Contingency Tables

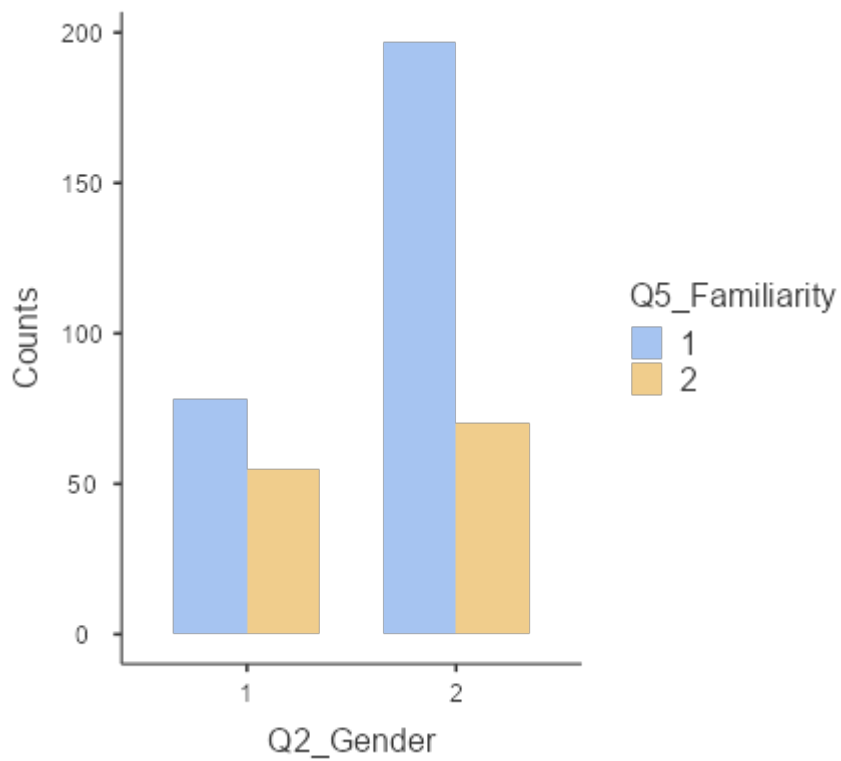
Q2_Gender	Q5_Familiarity		Total
	1	2	
1	78	55	133
2	197	70	267

Total	275	125	400
-------	-----	-----	-----

χ^2 Tests

	Value	df	p
χ^2	9.47	1	0.002
χ^2 continuity correction	8.78	1	0.003
Likelihood ratio	9.27	1	0.002
Fisher's exact test			0.003
N	400		

Plots



Contingency Tables

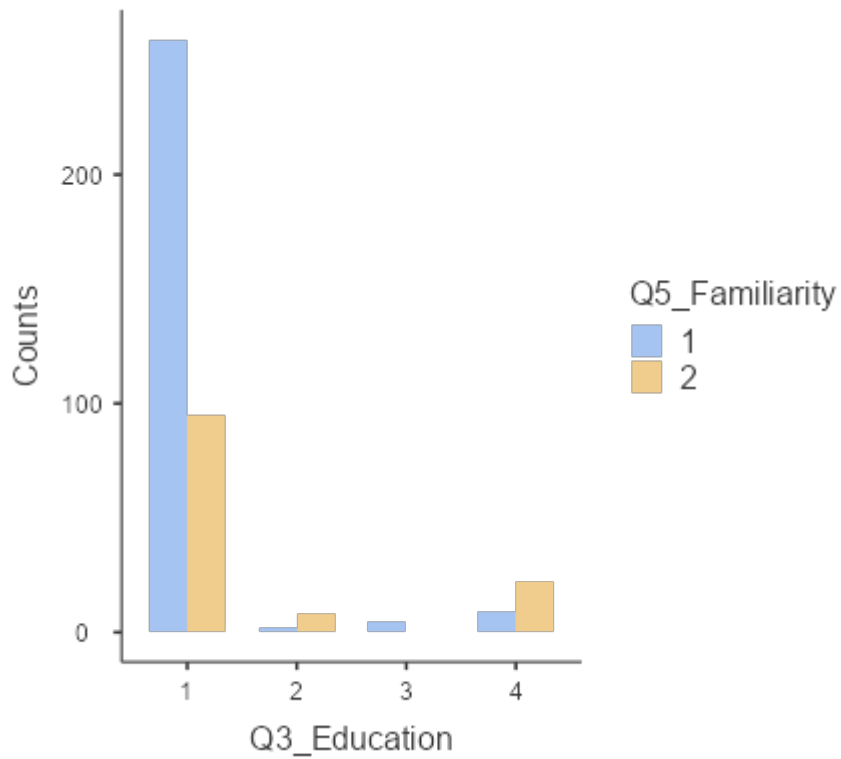
Contingency Tables

Q5 Familiarity

Q3_Education	1	2	Total
1	259	95	354
2	2	8	10
3	5	0	5
4	9	22	31
Total	275	125	400

χ^2 Tests			
	Value	df	p
χ^2	39.3	3	<.001
χ^2 continuity correction	39.3	3	<.001
Likelihood ratio	37.7	3	<.001
Fisher's exact test			<.001
N	400		

Plots



Contingency Tables

Contingency Tables

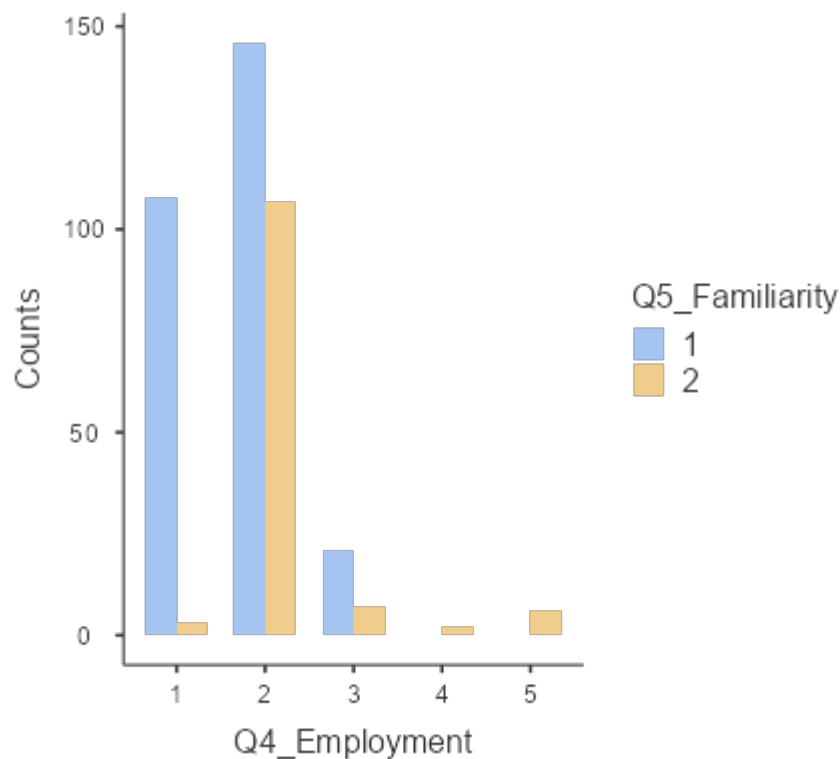
Q4_Employment	Q5_Familiarity		Total
	1	2	
1	108	3	111
2	146	107	253
3	21	7	28
4	0	2	2
5	0	6	6
Total	275	125	400

χ^2 Tests

	Value	df	p
χ^2	74.6	4	<.001

χ^2 continuity correction	74.6	4	<.001
Likelihood ratio	93.1	4	<.001
Fisher's exact test			<.001
N	400		

Plots



References

- [1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.
- [2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).
- [3] Meyer, D., Zeileis, A., Hornik, K., Gerber, F., & Friendly, M. (2023). *vcd: Visualizing Categorical Data*. [R package]. Retrieved from <https://cran.r-project.org/package=vcd>.

Results

Linear Regression

Model Fit Measures

Model	R	R ²	Adjusted R ²	Overall Model Test			
				F	df1	df2	p
1	0.414	0.172	0.166	28.2	2	272	<.001

Note. Models estimated using sample size of N=275

Model Coefficients - Q22_UselInsured

Predictor	Estimate	SE	95% Confidence Interval		t	p	95% Confidence Interval		
			Lower	Upper			Stand. Estimate	Lower	Upper
Intercept	5.164	0.3944	4.388	5.941	13.09	<.001			
Q20_SawCampaigns	-0.430	0.0758	-0.579	-0.281	-5.67	<.001	-0.315	-0.424	-0.205
Q21_CostImportance	-0.405	0.0947	-0.592	-0.219	-4.28	<.001	-0.238	-0.347	-0.128

Assumption Checks

Durbin–Watson Test for Autocorrelation

Autocorrelation	DW Statistic	p
-0.00607	2.00	0.968

[3]

Collinearity Statistics

VIF	Tolerance
-----	-----------

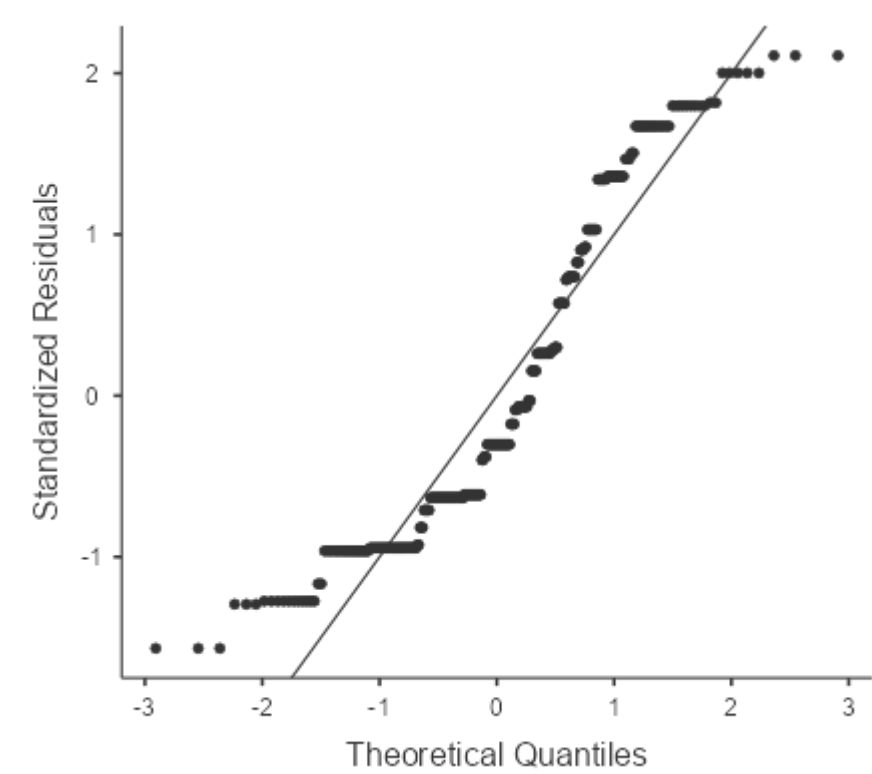
Q20_SawCampaigns	1.01	0.988
Q21_CostImportance	1.01	0.988

[3]

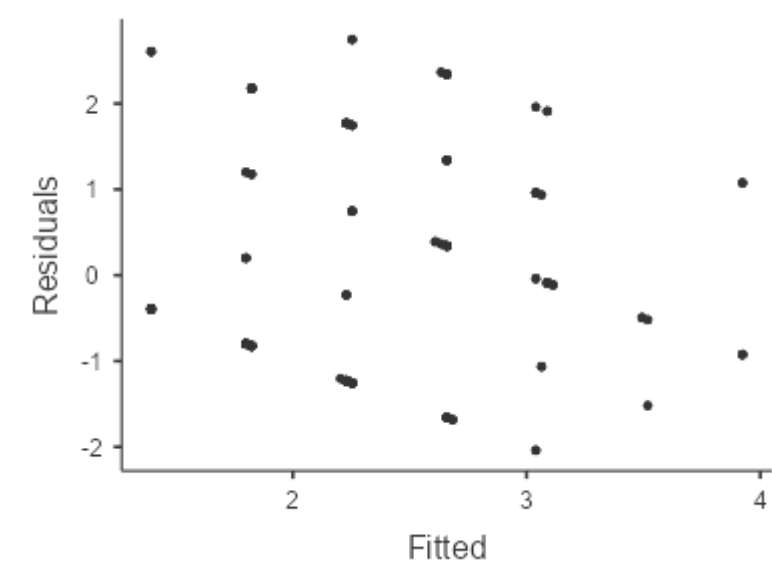
Normality Test (Shapiro-Wilk)

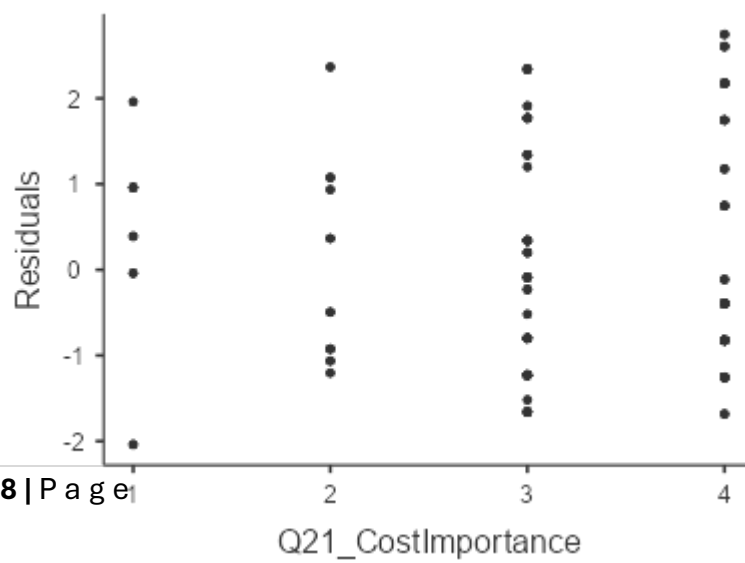
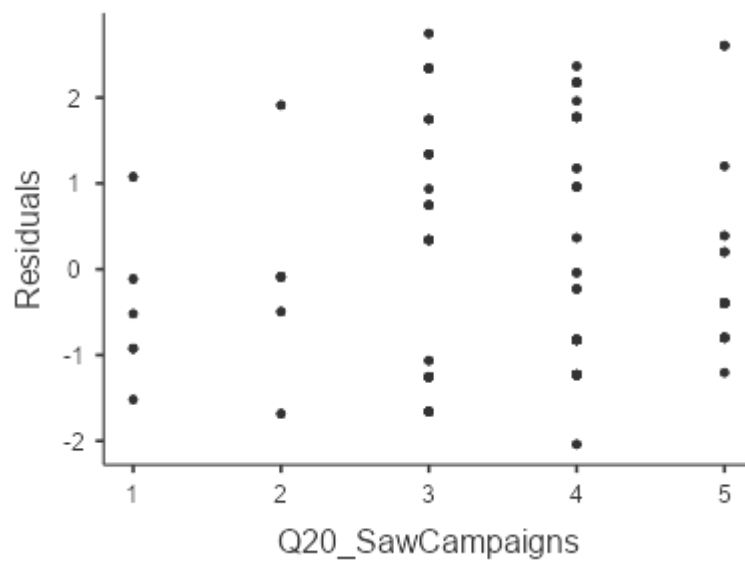
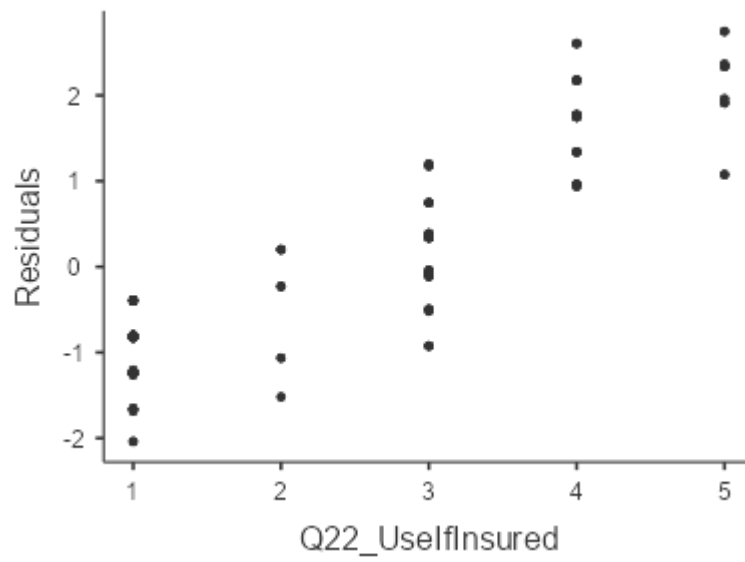
Statistic	p
0.901	<.001

Q-Q Plot



Residuals Plots





References

[1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.

[2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

[3] Fox, J., & Weisberg, S. (2023). *car: Companion to Applied Regression*. [R package]. Retrieved from <https://cran.rproject.org/package=car>.

Results

Correlation Matrix

Correlation Matrix

Correlation Matrix

Correlation Matrix

Correlation Matrix

Correlation Matrix

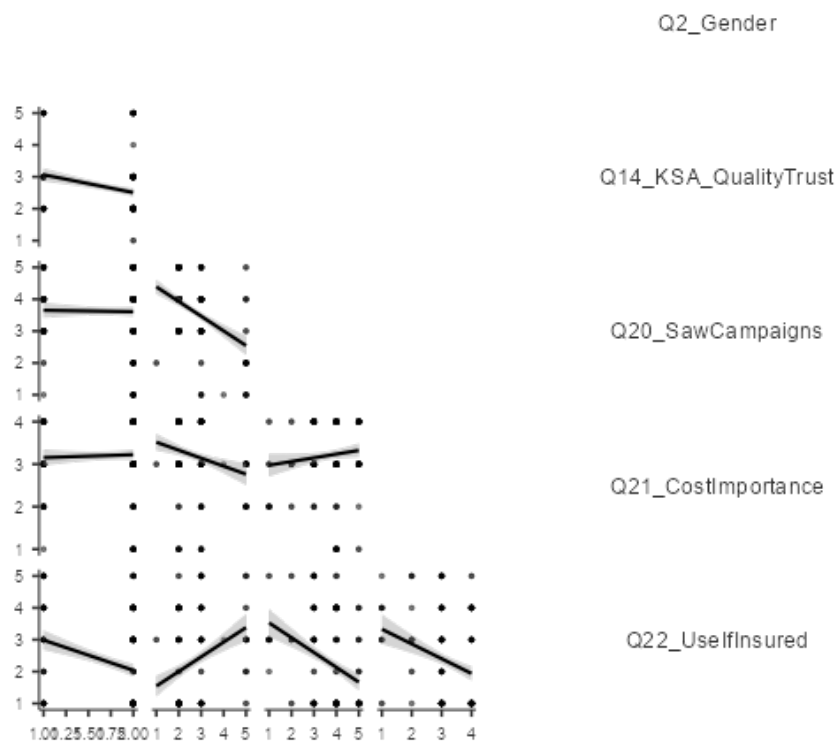
		Q2_Gender	Q14_KSA_QualityTrust	Q20_SawCampaigns	Q21_CostImportance	Q22_Usefulness
Q2_Gender	Spearman's rho	—				
	df	—				
	p-value	—				
	N	—				
Q14_KSA_QualityTrust	Spearman's rho	-0.333***	—			
	df	273	—			
	p-value	<.001	—			
	N	275	—			
Q20_SawCampaigns	Spearman's rho	0.014	-0.325***	—		
	df	273	273	—		
	p-value	0.817	<.001	—		

	N	275	275	—		
Q21_CostImportance	Spearman's rho	0.068	-0.191**	0.121*	—	
	df	273	273	273	—	
	p-value	0.263	0.001	0.044	—	
	N	275	275	275	—	
Q22_UseIfInsured	Spearman's rho	-0.301***	0.356***	-0.342***	-0.264***	—
	df	273	273	273	273	—
	p-value	<.001	<.001	<.001	<.001	—
	N	275	275	275	275	—

Note. * p < .05, ** p < .01, *** p < .001

Plot

Q2_Gender :SA_Qual: SawCamp CostImpor _UseIfInsi



Refer
ences

[1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.

[2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.rproject.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

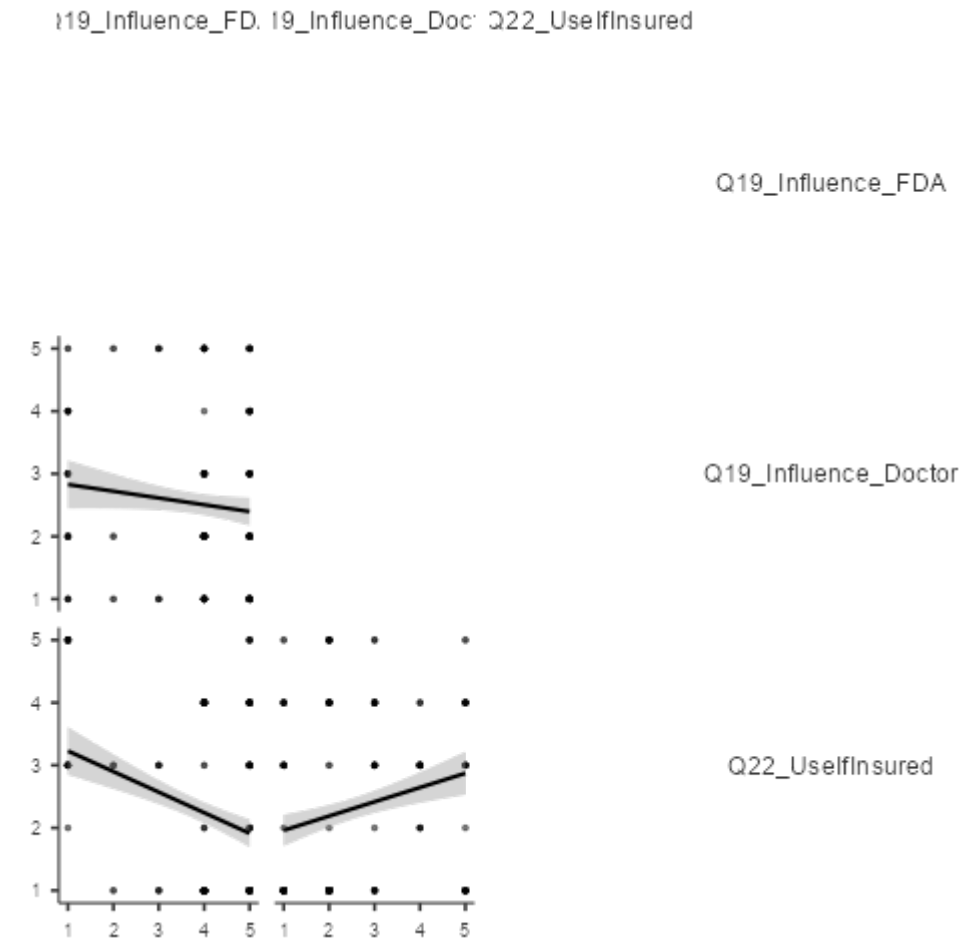
Results

Correl
ation
Matrix

Correlation Matrix		Q19_Influence_FDA	Q19_Influence_Doctor	Q22_UselInsured
Q19_Influence_FDA	Pearson's r	—	-0.104	-0.303***
	df	—	273	273
	p-value	—	0.087	<.001
	N	—	275	275
Q19_Influence_Doctor	Pearson's r	-0.104	—	0.219***
	df	273	—	273
	p-value	0.087	—	<.001
	N	275	—	275
Q22_UselInsured	Pearson's r	-0.303***	0.219***	—
	df	273	273	—
	p-value	<.001	<.001	—
	N	275	275	—

Note. * p < .05, ** p < .01, *** p < .001

Plot



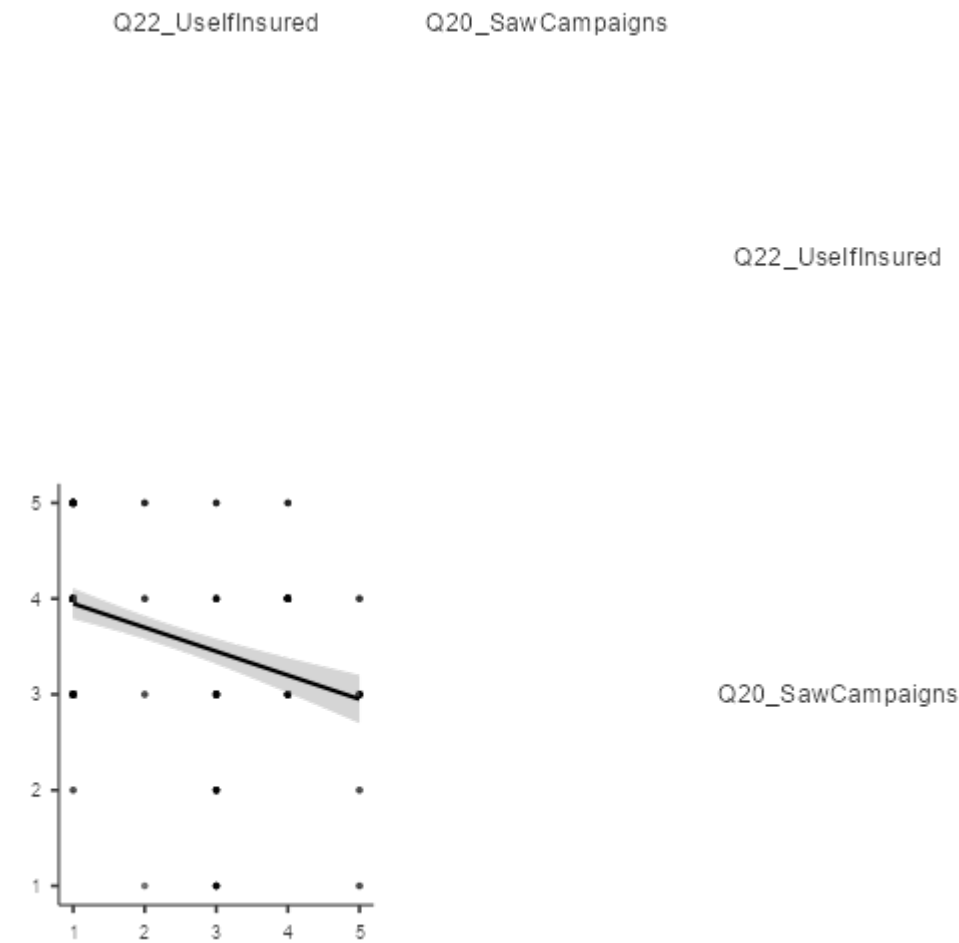
Correlation Matrix

Correlation Matrix		Q22_UseIfInsured	Q20_SawCampaigns
Q22_UseIfInsured	Pearson's r	—	
	df	—	
	p-value	—	
	95% CI Upper	—	
	95% CI Lower	—	
	Spearman's rho	—	

	df	—	
	p-value	—	
	Kendall's Tau B	—	
	p-value	—	
	N	—	
Q20_SawCampaigns	Pearson's r	-0.341***	—
	df	273	—
	p-value	<.001	—
	95% CI Upper	-0.232	—
	95% CI Lower	-0.441	—
	Spearman's rho	-0.342***	—
	df	273	—
	p-value	<.001	—
	Kendall's Tau B	-0.282***	—
	p-value	<.001	—
	N	275	—

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Plot



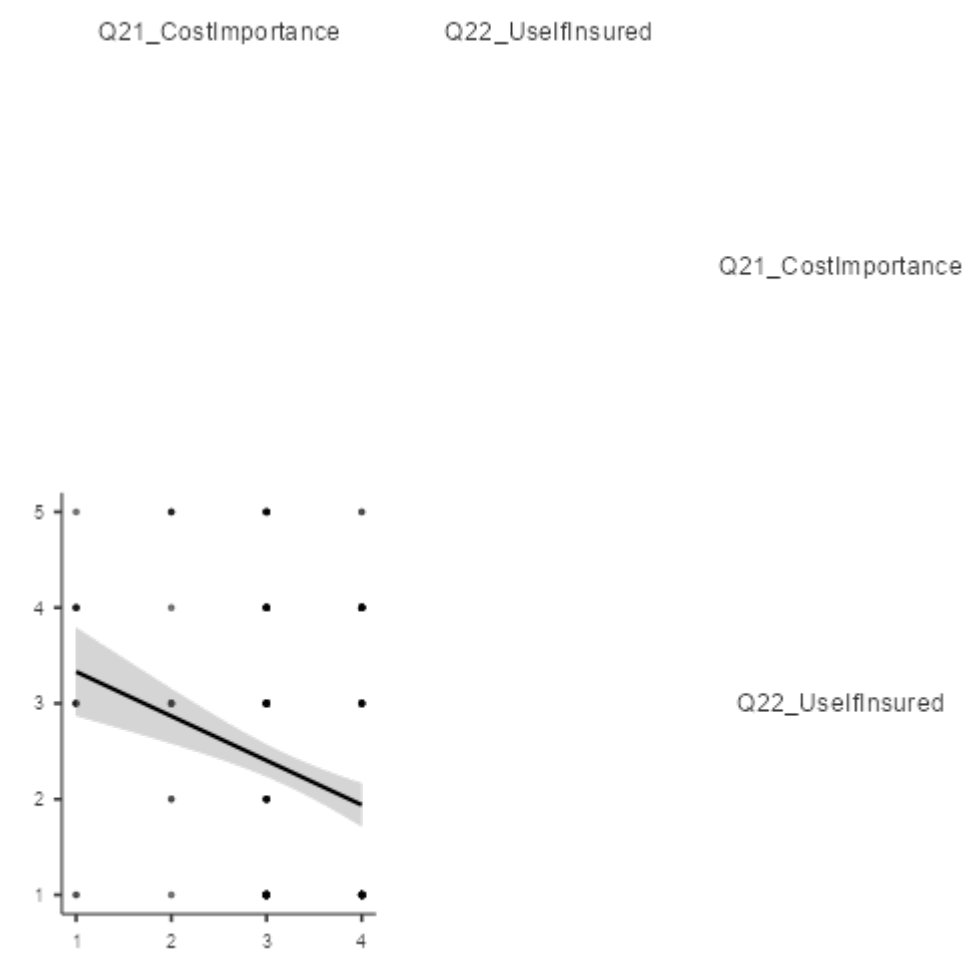
Correlation Matrix

Correlation Matrix		Q21_CostImportance	Q22_Uselnsured
Q21_CostImportance	Pearson's r	—	-0.272***
	df	—	273
	p-value	—	<.001
	N	—	275
Q22_Uselnsured	Pearson's r	-0.272***	—

df	273	—
p-value	<.001	—
N	275	—

Note. * p < .05, ** p < .01, *** p < .001

Plot



Correl
ation
Matrix

Correlation Matrix		
	Q11_Aware_Examples	Q22_UseIfInsured

Q11_Aware_Examples	Pearson's r	—	
	df	—	
	p-value	—	
	N	—	
Q22_UselfInsured	Pearson's r	0.046	—
	df	273	—
	p-value	0.444	—
	N	275	—

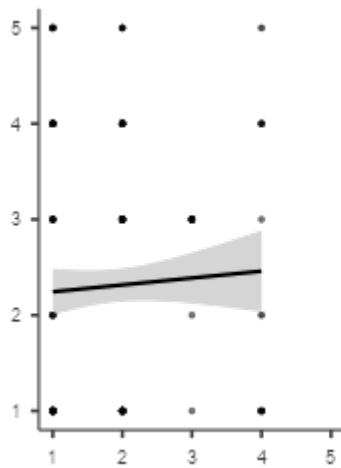
Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Plot

Q11_Aware_Examples

Q22_UseIfInsured

Q11_Aware_Examples



Q22_UseIfInsured

References

- [1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.
- [2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

Results

Correlation Matrix

Table 1

Table 1

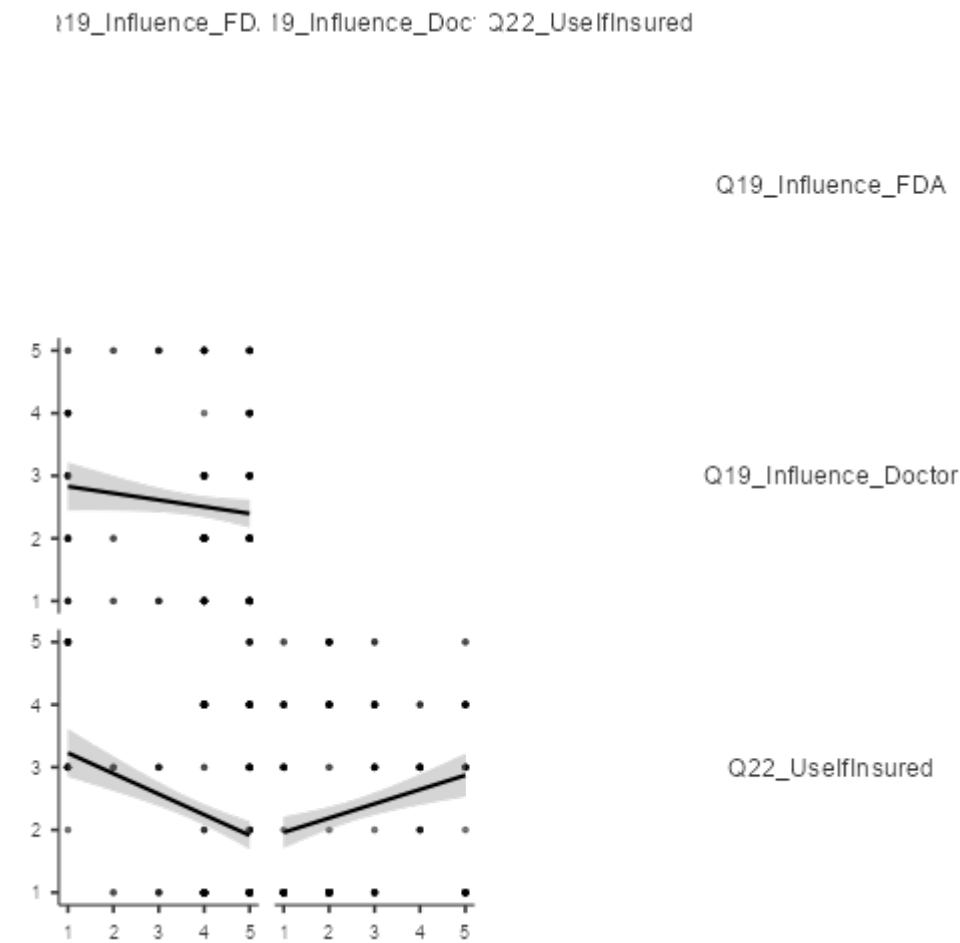
Table 1

Correlation Matrix

		Q19_Influence_FDA	Q19_Influence_Doctor	Q22_UsefulInsured
Q19_Influence_FDA	Pearson's r	—	-0.104	-0.303***
	df	—	273	273
	p-value	—	0.087	<.001
	N	—	275	275
Q19_Influence_Doctor	Pearson's r	-0.104	—	0.219***
	df	273	—	273
	p-value	0.087	—	<.001
	N	275	—	275
Q22_UsefulInsured	Pearson's r	-0.303***	0.219***	—
	df	273	273	—
	p-value	<.001	<.001	—
	N	275	275	—

Note. * p < .05, ** p < .01, *** p < .001

Plot



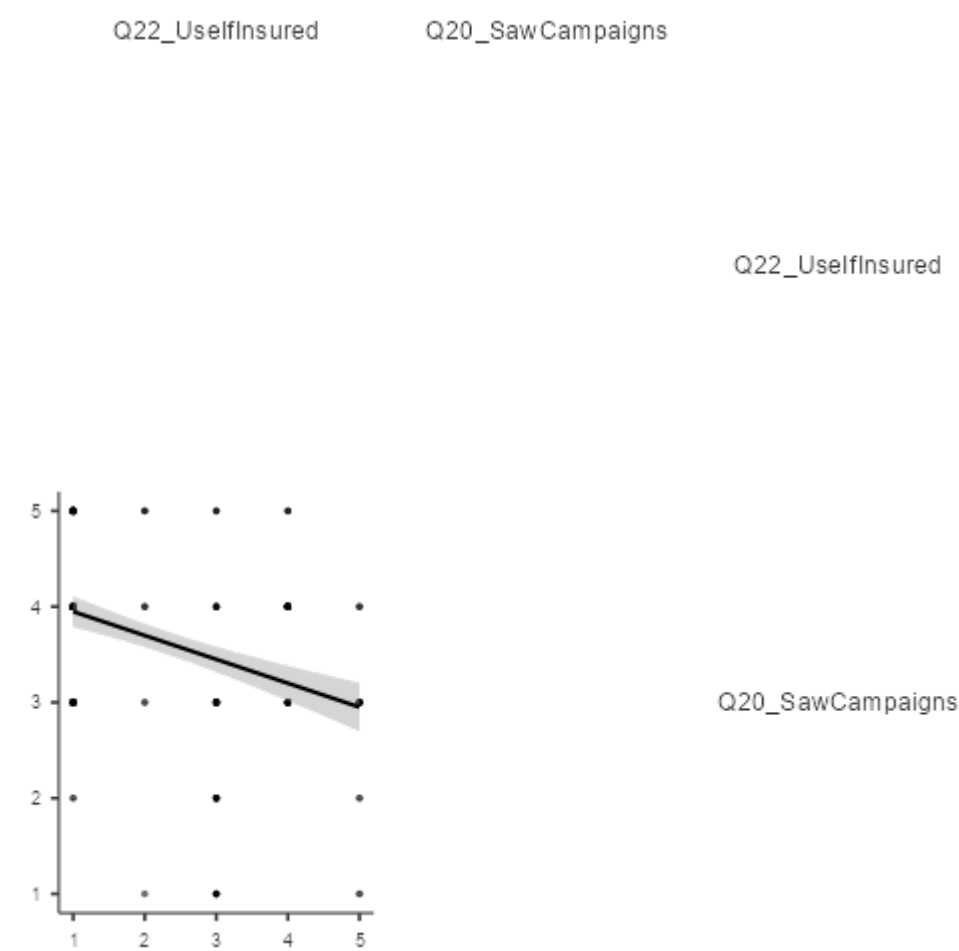
Correlation Matrix

Correlation Matrix		Q22_UselInsured	Q20_SawCampaigns
Q22_UselInsured	Pearson's r	—	
	df	—	
	p-value	—	

	95% CI Upper	—	
	95% CI Lower	—	
	Spearman's rho	—	
	df	—	
	p-value	—	
	Kendall's Tau B	—	
	p-value	—	
	N	—	
Q20_SawCampaigns	Pearson's r	-0.341***	—
	df	273	—
	p-value	<.001	—
	95% CI Upper	-0.232	—
	95% CI Lower	-0.441	—
	Spearman's rho	-0.342***	—
	df	273	—
	p-value	<.001	—
	Kendall's Tau B	-0.282***	—
	p-value	<.001	—
	N	275	—

Note. * p < .05, ** p < .01, *** p < .001

Plot



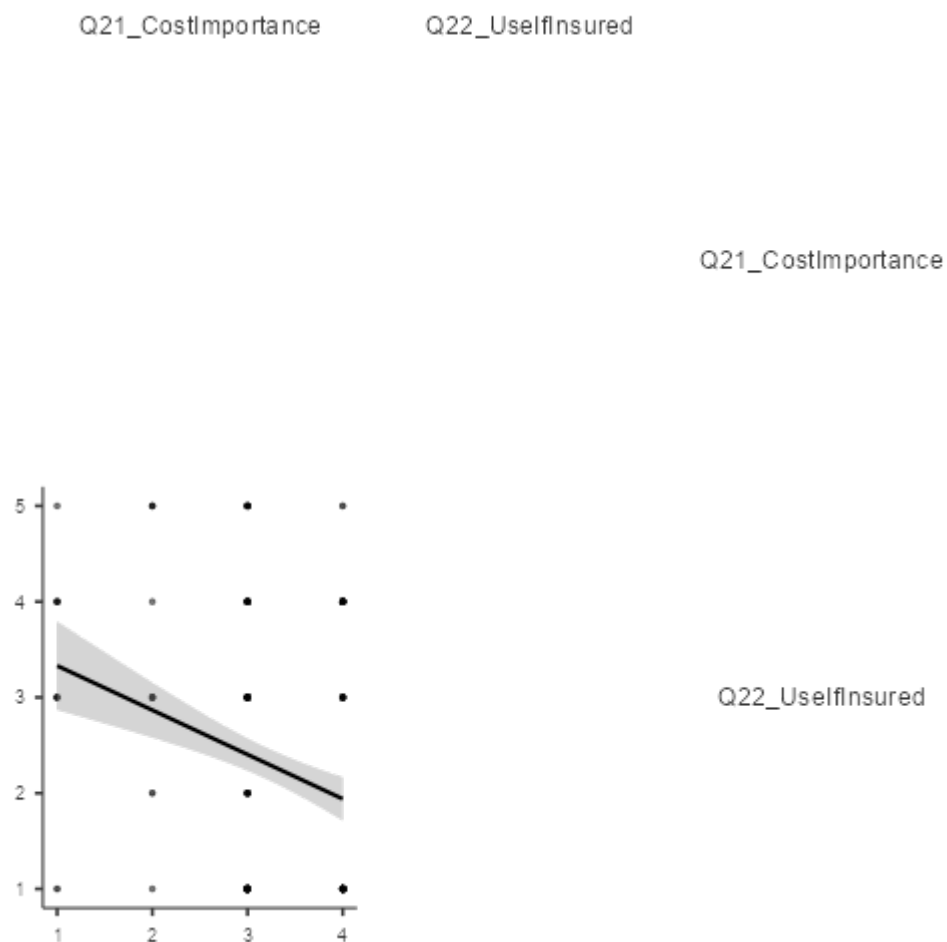
Correlation Matrix

Correlation Matrix		Q21_CostImportance	Q22_UseIfInsured
Q21_CostImportance	Pearson's r	—	-0.272***
	df	—	273
	p-value	—	<.001

	N	—	275
Q22_Uselnsured	Pearson's r	-0.272***	—
	df	273	—
	p-value	<.001	—
	N	275	—

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Plot



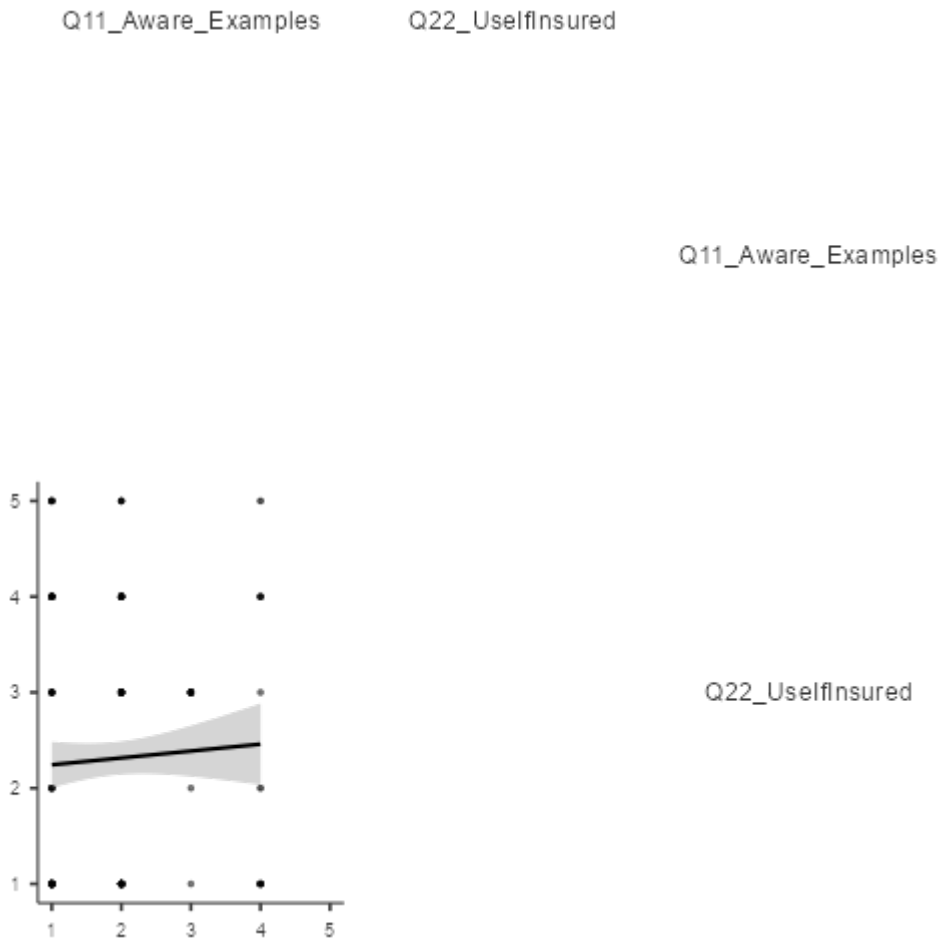
Correlation Matrix

Correlation Matrix

		Q11_Aware_Examples	Q22_UsefulInsured
Q11_Aware_Examples	Pearson's r	—	
	df	—	
	p-value	—	
	N	—	
Q22_UsefulInsured	Pearson's r	0.046	—
	df	273	—
	p-value	0.444	—
	N	275	—

Note. * p < .05, ** p < .01, *** p < .001

Plot



References

- [1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.
- [2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

Results

Generalized Linear Model

Model Info

Info	Value	Comment
Model Type	Linear	Classical Regression/ANOVA
Call	glm	Q22_Binary ~ 1 + Q5_Familiarity
Link function	Identity	Coefficients in the same scale of y
Distribution	Gaussian	Normal distribution of residual
R-squared	0.0998	Proportion of reduction of error
AIC	333.8050	Less is better
BIC	345.7800	Less is better
Deviance	53.1491	Less is better
Residual DF	398	
Chi-squared/DF	0.1335	Overdispersion indicator
Converged	yes	Whether the estimation found a solution

[3]

Model Results

Loglikelihood ratio tests

	X ²	df	p
Q5_Familiarity	44.1	1	<.001

Parameter Estimates

Names	Estimate	SE	95% Exp(B) Confidence Interval				
			exp(B)	Lower	Upper	z	p
(Intercept)	0.180	0.0183	1.20	1.16	1.24	9.85	<.001
Q5_Familiarity	0.262	0.0394	1.30	1.20	1.40	6.64	<.001

References

[1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.

[2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

[3] Gallucci, M. (2019). *GAMLj: General analyses for linear models*. [jamovi module]. Retrieved from <https://gamlj.github.io/>.

Results

Generalized Linear Model

Model Info		
Info	Value	Comment
Model Type	Linear	Classical Regression/ANOVA
Call	glm	Q22_UselInsured ~ 1 + Q19_Influence_Doctor + Q19_Influence_FDA + Q19_Influence_Price + Q19_Influence_Studies + Q20_SawCampaigns + Q21_CostImportance
Link function	Identity	Coefficients in the same scale of y
Distribution	Gaussian	Normal distribution of residual
R-squared	0.232	Proportion of reduction of error
AIC	919.756	Less is better
BIC	948.690	Less is better
Deviance	430.643	Less is better
Residual DF	268	
Chisquared/DF	1.607	Overdispersion indicator
Converged	yes	Whether the estimation found a solution

[3]

Model Results

Loglikelihood ratio tests			
	X ²	df	p

Q19_Influence_Doctor	5.537	1	0.019
Q19_Influence_FDA	0.277	1	0.599
Q19_Influence_Price	3.028	1	0.082
Q19_Influence_Studies	6.746	1	0.009
Q20_SawCampaigns	3.893	1	0.048
Q21_CostImportance	8.364	1	0.004

Parameter Estimates

95% Exp(B) Confidence Interval							
Name	Estimat	S	exp(B)	Lower	Upper	z	p
(Intercept)	2.3091	0.0764	10.065	8.665	11.692	30.208	<.001
Q19_Influence_Doctor	0.1378	0.0586	1.148	1.023	1.287	2.353	0.019
Q19_Influence_FDA	-0.0416	0.0790	0.959	0.822	1.120	-0.527	0.599
Q19_Influence_Price	-0.1479	0.0850	0.863	0.730	1.019	-1.740	0.083
Q19_Influence_Studies	-0.1887	0.0726	0.828	0.718	0.955	-2.597	0.010
Q20_SawCampaigns	-0.2041	0.1034	0.815	0.666	0.999	-1.973	0.050

Parameter Estimates							
	-0.2891	0.100	0.74	0.61	0.91	-2.892	0.00
Q21_CostImportance							

References

[1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.

[2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

[3] Gallucci, M. (2019). *GAMLj: General analyses for linear models*. [jamovi module]. Retrieved from <https://gamlj.github.io/>.

الملخص :

تهدف هذه الدراسة إلى استقصاء مدى تقبل المجتمع السعودي لاستخدام الأدوية البيولوجية المصنعة محليًا، وذلك في ظل التحول الاستراتيجي نحو التصنيع الدوائي الوطني ضمن رؤية المملكة 2030. تم استخدام استبانة إلكترونية مزدوجة اللغة لجمع البيانات من عينة مكونة من 400 مشارك من مختلف المناطق والفئات العمرية. واستندت الدراسة إلى نموذج السلوك المخطط (TPB) لتحليل تأثير عدة متغيرات على النية السلوكية، بما في ذلك الوعي، الثقة، التجربة السابقة، والعوامل الاقتصادية مثل السعر والتأمين.

أظهرت النتائج أن مستوى الوعي والثقة في جودة المنتج يؤثران بشكل إيجابي على نية التنبّي، في حين أن الحساسية للسعر وعدم فعالية الحملات التوعوية الحالية يشكّلان عوائق أمام التّقبّل. كما ظهرت فروقات دالة إحصائيًا بين الجنسين، حيث أبدى الذكور استعدادًا أكبر لاستخدام المنتجات المحلية.

توصي الدراسة بإعادة تصميم الحملات التوعوية بناءً على أسس سلوكية وتقسيمات ديموغرافية، مع التركيز على بناء الثقة من خلال شفافية المنتج وليس فقط المؤسسات. كما تدعو إلى دمج هذه الأدوية ضمن برامج التأمين الصحي وتطبيق تسعير قائم على القيمة.

الكلمات المفتاحية: الأدوية البيولوجية، التّقبّل المجتمعي، التصنيع المحلي، السعودية، السلوك الصحي، نظرية السلوك المخطط.