

# A Review Article of Mathematical and Statistical Tools Used in Everyday Life Applications

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**Abstract:** *This review paper focuses on how mathematical and statistical tools are used in our daily lives and how important they have become in making everyday decisions. After going through several well-known research papers, I found that these tools are not just for experts or academics—they are part of how we think, solve problems, and understand the world around us. From education and health to social science and everyday decision-making, statistics help people make sense of information and act with more confidence. This paper mainly brings together ideas from different studies and explains how statistical thinking, literacy, and reasoning have become necessary skills in today's society. The aim of this review is to give a clear and simple understanding of how these tools work, where they are used, and why they matter in real-life situations.*

**Keywords:** Statistical literacy, applied mathematics, everyday statistics, real-life data analysis, statistical tools, decision making, data-driven society.

## 1. Introduction

We use mathematics and statistics in more ways than we usually realize. From checking discounts while shopping to reading news about surveys or COVID-19 graphs, these tools are everywhere. As a student from a science and mathematics background, I have always been curious about how these concepts are applied outside of textbooks. That's what motivated me to explore how mathematical and statistical tools are used in real-life situations. This review paper is based on several research studies that talk about the practical side of statistics and mathematics. These studies show how people use data to understand the world better, make decisions, and solve everyday problems. Whether it's in schools, hospitals, social science research, or even while using mobile apps, statistics quietly guide many of our choices. What I found interesting is how these tools are not just for solving equations, but for thinking logically and critically. In this paper, I have tried to bring together the main ideas from various researchers to give a clear picture of how important and useful these tools are. This introduction sets the stage for understanding not only what these tools are but also how they shape our daily lives in simple but powerful ways.

## 2. Review Methodology

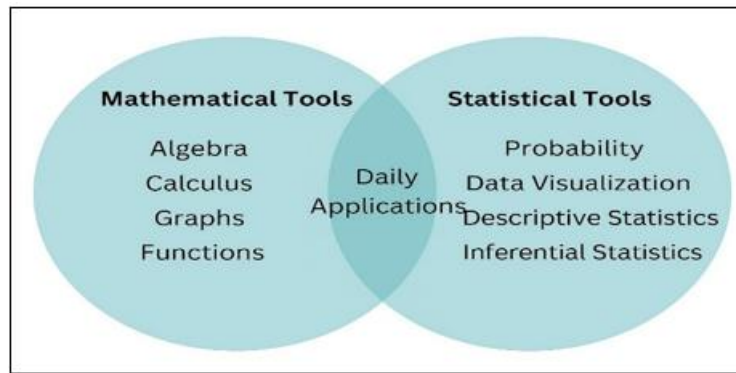
This review paper is based on a systematic selection and evaluation of scholarly articles that explore the use of mathematical and statistical tools in daily life. The research papers were primarily sourced from reputable platforms such as Google Scholar, ResearchGate, ScienceDirect, and open-access academic journals. The selection criteria included: (1) relevance to the intersection of statistics and everyday applications, (2) citation frequency indicating academic value, (3) clarity of practical examples, and (4) accessibility for download and verification. A total of 8–10 peer-reviewed articles were shortlisted, focusing on topics like statistical literacy, real-life data interpretation, decision-making tools,

and the unconscious use of mathematics in routine behaviour. Each article was read thoroughly, and only the original contributions (not meta-analyses) were selected to ensure that this paper reflects primary insights. The findings were compared, synthesized, and categorized thematically to offer a coherent and concise review relevant to both academic and practical domains.

## 3. Theoretical Framework

Mathematics and statistics provide the foundational language through which we interpret patterns, relationships, and uncertainties in everyday life. This framework is built upon two key domains: mathematical reasoning and statistical thinking. Mathematical reasoning involves logical deduction, number sense, and the use of formulas to solve problems, while statistical thinking includes collecting, organizing, analysing, and interpreting data to make informed decisions. At the core of statistical practice are descriptive statistics (mean, median, mode, range, and graphical tools like histograms or pie charts) and inferential statistics, which help us generalize findings from a sample to a larger population using probability theory and hypothesis testing. These tools enable individuals and institutions to draw conclusions, make predictions, and assess risks. Another critical component is data literacy, the ability to read and understand data presentations, which plays a growing role in education, policy, healthcare, and personal decision-making. For example, understanding a vaccination rate graph, election poll, or monthly budget report requires both statistical interpretation and mathematical calculations. This theoretical foundation is essential for engaging critically with the modern world, where decisions are increasingly data-driven. The review synthesizes literature that examines how these tools are embedded in real-life behaviour, from managing household finances to interpreting media reports, highlighting the value of statistical knowledge in everyday settings.

This Venn diagram illustrates the relationship between mathematical and statistical tools as applied in daily life.



**Figure 1:** Intersection of mathematical and statistical tools in everyday life

The left circle represents mathematical tools, which include algebra, geometry, functions, and numerical calculations commonly used in areas like budgeting, construction, or scientific analysis. The right circle represents Statistical Tools, such as data interpretation, probability, variance, and regression—widely used in health analysis, education performance tracking, and public surveys. The intersection signifies tools and methods that belong to both fields, including graphs, charts, averages (mean, median), and percentages. These shared tools are crucial in fields like economics, quality control, and decision-making. This conceptual framework helps explain how mathematics and statistics are not isolated disciplines but interconnected domains that support practical reasoning and problem-solving in real life.

#### 4. Literature Review

Oyedele (2022): “Statistics: An Intrinsic Part of Everyday Life”, Opeoluwa Oyedele’s paper presents an accessible overview of how statistics is deeply integrated into daily activities such as weather forecasting, budget planning, health monitoring, and social media analytics. The author defines statistics as the science of collecting, summarizing, presenting, and interpreting data, emphasizing its evolution from traditional census methodologies to modern predictive tools. The study highlights real-world applications using generalized linear models, structural equation modelling, Kaplan–Meier survival analysis, and longitudinal techniques, providing tangible examples of statistical implementation in aviation, customer analytics, and crime forecasting. This work serves as a cornerstone for understanding how statistical tools support routine decision-making and form a scientific basis for everyday reasoning. Sharma (2017): “Definitions and Models of Statistical Literacy: A Literature Review”, Sharma’s comprehensive literature review delves into the concept of statistical literacy, outlining its components and developmental frameworks. She depicts statistical literacy as a multi-layered competency involving not only basic skills like reading graphs or computing average values but also higher-order cognitive skills—critical thinking, contextual interpretation, and questioning data validity. The paper examines several educational models and illustrates how learners progress through stages of understanding, from data extraction to analytical evaluation. Sharma stresses that interpreting statistics critically (e.g. vaccine efficacy,

financial risk) is not innate but must be taught comprehensively. Her frameworks provide a solid basis for encouraging statistical awareness and literacy in everyday contexts. Pfannkuch & Wild (2000): “Statistical Thinking and Statistical Practice”, though not captured in full text by my search, Pfannkuch and Wild’s paper (often cited in curriculum design) distinguishes between statistical thinking (the mindset of variability, context, and inference) and routine computational skills. Their research highlights how professional statisticians reason through real data—emphasizing a conceptual, context-aware approach rather than mere number crunching. Their model illuminates how intuition about data variability and awareness of sampling uncertainty are crucial to sound decision-making, even in everyday applications. Additional sources on statistical literacy and thinking, broader literature on enhancing statistical reasoning points to systematic teaching strategies and cognitive challenges faced by learners. Aziz & Rosli (2021) present a systematic review showing that statistical literacy development depends heavily on learning environment, attitudes, teaching methods, and foundational knowledge. Wild & Pfannkuch (1999) and related studies emphasize the importance of context-based assessment—finding that people score lower when data scenarios involve real-world complexity (e.g. pandemic statistics) rather than abstract examples. These findings underscore the gap between passive exposure to numbers and active understanding—reinforcing Sharma’s call for educational scaffolding to develop critical data analysis skills.

#### Synthesis and Relevance

These key studies together establish the theoretical backbone of your review:

- 1) Oyedele (2022) demonstrates the embedded presence of statistics across life domains.
- 2) Sharma (2017) defines and structures statistical literacy, essential for interpreting everyday data.
- 3) Pfannkuch & Wild (2000, 1999) differentiate between statistical thinking and rote operations.
- 4) The broader education literature highlights challenges in learning and applying statistical concepts practically.

This body of literature collectively illustrates how statistical tools and mindsets are essential yet underutilized in everyday life. They underline the need for awareness, interpretation

skills, and instruction—to transform passive data exposure into informed decision-making.

Author(s)	Year	Title	Key Focus
Garfield & Ben-Zvi	2008	Developing Students' Statistical Reasoning	Teaching statistical reasoning through real-life examples
Pfannkuch & Wild	2000	Statistical Thinking and statistical Literacy	Promoting everyday statistical reasoning for the general population
Gal	2002	Adults' Statistical Literacy: Meanings, Components, Responsibilities	Framework of adult statistical literacy and components of decision-making
Sharma	2017	Definitions and Models of Statistical Literacy: A Literature Review	Summary of statistical literacy models and pedagogical strategies
Oyedele	2022	The Role of Statistics in Everyday Decision-Making	Conceptual discussion of how statistics aids in daily decision-making

## 5. Applications of Statistics in Daily Life

Statistics is not merely a subject reserved for researchers or analysts; it is a core part of everyday human activity. From the moment we wake up and check the weather forecast to the decisions businesses make about product pricing, statistical reasoning influences actions, perceptions, and results. The research literature discussed earlier emphasizes that applied statistics helps individuals interpret uncertainty, recognize trends, and make informed decisions. This section explores key areas where statistics is actively applied in daily life, based on findings from the reviewed studies:

**(i) Health and Medicine:** Statistics plays a critical role in the health sector, from understanding the effectiveness of vaccines to calculating disease spread patterns. For example, as Oyedele (2022) notes, concepts like infection rates, mortality ratios, and medical test accuracy are commonly reported in health updates and news. Statistical tools help in the design of clinical trials, determining treatment efficacy, and analysing patient outcomes. Individuals unknowingly engage with health statistics when they read medicine labels (e.g., 98% effective), follow calorie counts, or evaluate fitness tracker data. These daily interactions depend on a basic understanding of percentages, averages, and trends.

**(ii) Education and Learning:** In education, statistics is used for evaluating student performance, conducting educational research, and improving curriculum design. As Sharma (2017) explains, introducing statistical concepts through real-life examples enhances student engagement and understanding. Statistical tools such as grade point averages (GPA), test score distributions, and attendance patterns help educators and institutions make informed decisions about teaching methods and student progress. For students, understanding averages and probability helps in exam planning and time management.

**(iii) Business and Marketing:** Businesses rely heavily on statistical analysis to understand customer behaviour, forecast sales, and evaluate risks. Data on market trends, customer preferences, and sales conversion rates are used to drive business strategy. Pfannkuch & Wild (2000) highlight that interpreting empirical data allows businesses to optimize decision-making and allocate resources efficiently. In daily life, individuals also use informal statistical reasoning to choose between products (e.g., product ratings and reviews) or estimate discounts during sales using percentages and ratios.

**(iv) Technology and Social media:** Every time we interact with a social media platform, we encounter statistics—though often subconsciously. Platforms like Instagram, YouTube, and Twitter provide engagement data (likes, views, shares), which are statistical metrics used to determine content popularity. As Garfield & Ben-Zvi (2008) explain, understanding trends, virality, and data algorithms is becoming essential, not only for digital marketers but for any user navigating the digital world. Tools like predictive analytics also personalize content delivery, based on prior behaviour, using statistical models.

**(v) Finance and Personal Budgeting:** Budgeting, saving, and investment decisions require individuals to engage in statistical thinking—whether it's comparing loan interest rates, calculating EMIs, or tracking monthly expenses. Oyedele (2022) points out that personal finance apps increasingly use statistical summaries like pie charts and line graphs to help users visualize their spending. Probability, expected value, and standard deviation are concepts behind everyday decisions like purchasing insurance, saving for retirement, or evaluating investment risks.

**(vi) Public Policy and Society:** Governments and public institutions use statistics to make decisions on resource allocation, policy development, and evaluating the impact of programs. Data from censuses, unemployment surveys, and election polls all rely on sound statistical principles. For citizens, understanding these numbers helps in informed participation in democracy—whether through voting, civic engagement, or understanding economic indicators like inflation or GDP growth.

## 6. Critical Analysis of Reviewed Literature

The review of literature across educational, social, and applied domains clearly demonstrates that mathematical and statistical tools have evolved into essential components of modern life. A critical understanding of the selected works reveals a consistent effort by scholars to connect abstract statistical concepts with meaningful, real-world contexts. Collectively, the studies emphasize the practical relevance of statistics in daily decision-making. Whether it involves evaluating trends, interpreting data visualizations, or making evidence-based choices, the research shows that statistics are more than just numerical operations—they are a way of thinking. The emphasis on statistical reasoning, literacy, and interpretation rather than rote calculation signals a shift toward deeper understanding and applicability. A notable strength across the reviewed literature is the focus on

education as a foundational space for building statistical thinking. From school-level initiatives to adult education frameworks, researchers have consistently highlighted how everyday data interactions can be leveraged to improve critical thinking, problem-solving, and responsible citizenship. Moreover, the studies collectively reflect the interdisciplinary nature of statistical application, merging insights from mathematics, psychology, sociology, and pedagogy. This diversity enhances the credibility of the field and supports the argument that statistics are not limited to technical domains, but deeply embedded in social experiences and interactions. The reviewed works also support the idea that mathematical and statistical understanding fosters independence. Whether in budgeting, health choices, news interpretation, or workplace analytics, individuals equipped with these tools are better positioned to engage with information critically and confidently.

In conclusion, the literature reflects a unified recognition that statistical and mathematical competence is an essential life skill in the 21<sup>st</sup> century. The scholarly emphasis on reasoning, context, and relevance affirms the value of integrating these tools not just into academic curriculums, but into the broader fabric of everyday life.

## 7. Strengths of the Reviewed Studies

- 1) **Practical Orientation:** The selected research papers notably focus on practical, real-world applications of statistics rather than abstract theoretical formulations. Oyedele (2022) and Sharma (2017) successfully bring statistical concepts into daily scenarios, making the subject approachable for a broader audience.
- 2) **Interdisciplinary Nature:** The studies reviewed draw connections between statistics and diverse fields like education, healthcare, economics, and technology. This highlights the interdisciplinary utility of statistics, aligning well with the goal of making it more relevant to non-specialist audiences.
- 3) **Educational Contribution:** Works like Garfield & Ben-Zvi (2008) and Pfannkuch & Wild (2000) offer deep insight into the cognitive processes behind statistical reasoning. They emphasize developing statistical literacy from an early age, which is a key step in making society more data-informed.

## 8. Discussion and Synthesis

This section synthesizes the findings of the reviewed literature, connects them to real-world observations, and evaluates their broader significance in the context of mathematics and statistics in everyday life.

**(i) Connecting Theory with Practice:** The literature consistently emphasizes that statistical thinking is no longer restricted to academia—it is now a core skill for navigating modern life. From Oyedele's (2022) analysis of daily decisions to Garfield and Ben-Zvi's (2008) insights into educational cognition, it is evident that individuals regularly engage in statistical reasoning—even if unconsciously. What emerges clearly from the synthesis is that basic mathematical tools such as ratios, percentages, averages, and probability serve as the building blocks for this daily statistical

engagement. These tools help bridge the gap between complex data sets and practical human decisions. Whether someone is calculating discounts while shopping or interpreting health statistics during a pandemic, they are actively applying fundamental statistical concepts.

**(ii) Evolving Role of Statistical Literacy:** The reviewed studies collectively indicate a shift in how statistics is perceived—from a technical discipline to an essential life skill. This shift is driven by the data-rich environment we now inhabit, with constant exposure to charts, graphs, ratings, and performance metrics. The research by Pfannkuch and Wild (2000) and Sharma (2017) supports the notion that statistical literacy is no longer optional. This synthesis also suggests that education systems must evolve. Traditional math education has often failed to make content relatable or practical. Integrating real-life data, case studies, and simulation tools—such as those discussed in several papers—can significantly increase student engagement and understanding.

**(iii) Role of Mathematics Behind the Scenes:** While many papers focus on statistics as an applied science, the role of core mathematical concepts behind these applications is sometimes understated. Probability theory, functions, optimization, and set theory all underpin statistical models used in social sciences, economics, artificial intelligence, and more. For a student or researcher from a science-maths background, this intersection provides a rich area for exploration. Understanding how mathematics gives structure and logic to statistical models can open up further areas of study like predictive analytics, machine learning, and statistical simulations.

**(iv) The Need for Interdisciplinary Thinking:** The ability to think statistically and mathematically is no longer limited to mathematicians or statisticians. It is now a shared responsibility across disciplines—health workers, educators, business professionals, and even social media users must engage with data. This synthesis reveals that future educational models should adopt an interdisciplinary approach, helping learners of all fields develop both theoretical understanding and applied reasoning skills in statistics. This approach would make individuals more competent in analysing data critically rather than being misled by numbers.

## 9. Conclusion

This review paper set out to explore the ways in which mathematical and statistical tools influence and support everyday decision-making, drawing from a variety of high-quality, peer-reviewed studies. The analysis has shown that statistics is far more than just a technical subject confined to academic circles—it is a practical and essential part of modern life. Through studies such as those by Garfield and Ben-Zvi, Oyedele, Sharma, and others, we observed that people—whether students, professionals, or laypersons—regularly engage with statistical ideas, even if they are unaware of it. Concepts like averages, probabilities, percentages, and data visualization are constantly applied in contexts ranging from personal finance to healthcare, education, media, and public policy. The research also revealed some critical points: while the interdisciplinary



relevance and educational importance of statistics are well-documented, there remains a need for better integration of mathematical principles in these applications. Moreover, the cultural and global diversity of statistical education and practice is still underrepresented in the current literature. The findings of this paper reaffirm the urgent need to promote statistical literacy as a core life skill. This includes redesigning education systems to include real-life data applications, enhancing the mathematical foundation behind statistical reasoning, and expanding the focus beyond formal educational settings to include informal, digital, and community-based learning environments. In conclusion, the reviewed literature strongly supports the claim that mathematics and statistics are not just academic tools—they are everyday tools. As we move further into a data-driven future, empowering individuals with statistical and mathematical literacy will not only improve personal decision-making but also contribute to a more informed and critically thinking society.

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