

Leadership Strategies and Food Safety Control Performance: Evidence from a Malaysian Public Regulatory Agency

Shanmugam Supramaniam¹, Gazi Md Nurul Islam²

¹Food Safety and Quality Division, Ministry of Health Malaysia

²Universiti Tun Abdul Razak, Kuala Lumpur, Malaysia

DOI: <https://doi.org/10.47772/IJRISS.2026.100900182>

Received: 16 September 2026; Accepted: 21 September 2026; Published: 05 October 2026

ABSTRACT

Food safety remains a major public health and economic concern, requiring regulatory authorities to maintain effective and consistent food safety control throughout the supply chain. Although Malaysia has established comprehensive food safety legislation and regulatory systems, variations in enforcement performance indicate that organizational factors may influence regulatory effectiveness. This study examined the association between leadership strategies and perceived food safety control performance within the Food Safety and Quality Division (FSQD), Ministry of Health Malaysia (MOH). A quantitative cross-sectional survey was conducted among 211 permanent Food Technology Officers. Leadership strategies were measured using five dimensions: idealized influence, inspirational motivation, intellectual stimulation, individualized consideration, and empowering leadership, while food safety control performance was assessed using officers' perceptions of organizational performance. Data were analyzed using regression analysis and partial least squares structural equation modelling (PLS-SEM). The PLS-SEM results demonstrated a significant positive relationship between leadership strategies and food safety control performance ($\beta = 0.581$, $t = 9.00$, $p < .001$; 95% CI [0.454, 0.707]). Supplementary regression analysis also showed a positive relationship (unstandardized $b = 0.768$, $t = 21.094$, $p < .001$), with leadership strategies accounting for 68.0% of the variance in perceived food safety control performance in the supplementary regression ($R^2 = 0.680$). These findings indicate a positive association between leadership strategies and officers' assessments of organizational performance. Leadership development may be relevant to regulatory coordination and implementation of food safety policies. The study applies Transformational Leadership Theory in a public food safety regulatory setting and identifies leadership development as an area for further consideration.

Keywords: Leadership strategies; transformational leadership; food safety control performance; public regulatory agency; food safety governance; Malaysia.

INTRODUCTION

Leadership has long been recognized as a fundamental determinant of organizational performance, particularly within public sector institutions where policy implementation, accountability, and service delivery depend on effective coordination of people and organizational resources (Denhardt & Denhardt, 2015; Northouse, 2022; Rainey, 2014). Unlike private organizations, where organizational success is commonly assessed through financial performance or market competitiveness, public regulatory agencies are responsible for translating legislation and government policies into effective operational practices while maintaining public trust, transparency, and institutional integrity (OECD, 2023; United Nations, 2023). Consequently, leadership extends beyond administrative responsibility and serves as a strategic organizational capability that influences regulatory effectiveness, organizational performance, and the quality of public service delivery.

Effective leadership has become increasingly important as regulatory authorities operate in an environment characterized by globalized food supply chains, evolving scientific knowledge, emerging foodborne hazards, and increasing public expectations for safe food (Codex Alimentarius Commission, 2023; Food and Agriculture Organization & World Health Organization [WHO], 2022; WHO, 2022). Through enforcing food legislation, national food safety authorities are expected to coordinate inspections, manage food safety incidents,

communicate risks, collaborate with multiple stakeholders, and respond rapidly to emerging threats. These responsibilities require leaders who can provide strategic direction, motivate regulatory personnel, facilitate evidence-based decision-making, and ensure the consistent implementation of food safety policies across different administrative levels (OECD, 2023; Van Wart, 2017).

In Malaysia, these responsibilities are undertaken by the FSQD, MOH, which administers the Food Act 1983, the Food Regulations 1985, and the Food Hygiene Regulations 2009 (Ministry of Health Malaysia, 1983, 1985, 2009). The Division is also responsible for implementing national food safety programmes, including Hazard Analysis and Critical Control Point (HACCP), Good Manufacturing Practice (GMP), and *Makanan Selamat Tanggungjawab Industri* (MeSTI). These include inspection, surveillance, import and export control, laboratory coordination, and food safety promotion (Food Safety and Quality Division, 2024). The diverse regulatory responsibilities require leadership capable of coordinating activities across Headquarters, State Health Departments, and District Health Offices while ensuring consistent policy implementation and enforcement throughout the national food safety system.

The Food Safety and Quality Division Annual Report (2024) recorded 107,951 food premises inspections, 2,472 temporary premise closures due to hygiene related non-compliance, 48,637 notices issued under Section 32B of the Food Act 1983, and 39,884 compounds imposed during the year (Food Safety and Quality Division, 2024). These regulatory activities are consistent with quality management principles, which recognize leadership as a driving force behind organizational effectiveness and continuous improvement (Deming, 1986; EFQM, 2020).

Previous food safety research has predominantly focused on technical and operational aspects of food safety, including food hygiene practices, HACCP implementation, food safety management systems, food-handler knowledge, and consumer awareness (Ishak et al., 2019; Kamsani et al., 2022; Unnevehr, 2015). Similarly, leadership research has been widely undertaken in healthcare, education, manufacturing, and commercial organizations, where transformational leadership has consistently demonstrated positive effects on organizational performance (Judge & Piccolo, 2004; Northouse, 2022; Wang et al., 2011). However, empirical evidence from specialized public food safety regulatory agencies remains limited, resulting in insufficient understanding of how leadership strategies influence organizational performance within the context of national food safety governance.

LITERATURE REVIEW

Transformational Leadership in Public Regulatory Organizations

Transformational leadership focuses on the way leaders provide direction, motivate employees, encourage new ideas, and support individual development (Bass, 1985; Bass & Riggio, 2006). These are reflected in four established dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Their application within a regulatory agency must also take account of legislation, formal procedures, and public accountability (Van Wart, 2017).

Previous studies have reported a positive relationship between transformational leadership and organizational performance in different settings (Judge & Piccolo, 2004; Wang et al., 2011). Leadership has also been associated with employee commitment, learning, communication, and service quality (García-Morales et al., 2008; Northouse, 2022). However, these findings cannot be assumed to apply in the same way to a national food safety regulatory agency.

Leadership practices may work differently across organizations because their objectives, responsibilities, and operating conditions differ (Van Wart, 2017; OECD, 2017). In public regulatory agencies, leaders must guide staff while ensuring that decisions remain within legislation and established procedures.

This regulatory context also explains the inclusion of empowering leadership in the present study. Food Technology Officers sometimes need to exercise professional judgement when handling inspections and enforcement matters. Leaders can support that judgement through guidance, delegated authority, and institutional backing, while officers remain accountable to legal requirements and standard operating procedures. Empowering leadership is therefore included as an additional, context-specific dimension of Leadership

Strategies. It is not one of the four established dimensions of transformational leadership (Bass & Riggio, 2006; Van Wart, 2017).

Recent public administration research further indicates that transformational leadership has become increasingly important as governments respond to digital transformation, institutional reform, cross-sector collaboration, and rapidly evolving public expectations (OECD, 2023; United Nations, 2023).

There is still limited research on leadership within specialized food safety regulatory agencies. The FSQD provides a relevant setting because its work involves technical decisions, enforcement responsibilities, and coordination between headquarters, state, and district offices. This study examines leadership in that setting through officers' perceptions of organizational performance.

Leadership Strategies and Food Safety Control Performance

Food safety governance has evolved substantially over recent decades as food supply chains have become increasingly globalized, technologically advanced, and interconnected. The growing complexity of food production, international trade, emerging biological and chemical hazards, antimicrobial resistance, climate change, and rising consumer expectations has significantly expanded the responsibilities of national food safety authorities beyond traditional regulatory enforcement (WHO, 2022; FAO & WHO, 2022; Codex Alimentarius Commission, 2023). Consequently, regulatory agencies are now required to integrate scientific risk assessment, surveillance, emergency preparedness, stakeholder engagement, and international collaboration into their routine regulatory activities to ensure effective food safety governance.

Within the FSQD, Food Technology Officers undertake food premise inspections, food sampling, HACCP audits, surveillance, enforcement, and policy implementation. Their responsibilities are carried out at Headquarters, State Health Departments, and District Health Offices. Leadership is relevant to communication across these levels and to the guidance officers receive when applying food safety requirements in practice.

However, evidence on the relationship between these leadership practices and officers' assessments of food safety control performance remains limited.

Research Gap and Hypothesis Development

Most leadership studies have examined commercial organizations or general public-sector settings, with less attention given to specialized agencies responsible for food safety regulation (Van Wart, 2017; OECD, 2023). The FSQD's nationwide structure provides an opportunity to examine this relationship in a regulatory setting.

Food safety research has concentrated mainly on hygiene, HACCP, food safety management systems, and compliance (Ishak et al., 2019; Kamsani et al., 2022; Unnevehr, 2015). The role of organizational leadership in officers' assessments of regulatory performance has received less attention.

Building upon these gaps, the following hypothesis is proposed.

H1: Leadership Strategies are positively associated with perceived Food Safety Control Performance within the FSQD, MOH.

METHODOLOGY

Research Design

This study employed a quantitative cross-sectional survey design to examine the relationship between Leadership Strategies and Food Safety Control Performance within the FSQD, MOH. A quantitative approach was selected because it enables the empirical examination of relationships between latent constructs using structured measurement instruments and statistical analysis, while a cross-sectional design facilitates the collection of data from a large population at a single point in time (Creswell & Creswell, 2018; Sekaran & Bougie, 2020).

Population, Sampling and Respondents

The target population comprised 342 permanent Food Technology Officers who were directly involved in food safety regulation within the FSQD. A stratified probability sampling technique was employed to ensure proportional representation across the different administrative levels of the food safety regulatory system. A total of 211 usable questionnaires were obtained, representing a response rate of 61.7%. The achieved sample size was considered adequate for Partial Least Squares Structural Equation Modelling (PLS-SEM), which is suitable for analyzing complex latent constructs with moderate sample sizes (Hair et al., 2022).

The respondents worked at Headquarters, State Health Departments, and District Health Offices. Their administrative levels, grades, and years of service are summarized in Table 1.

Table 1: Demographic Characteristics of the Study Respondents

Variable	Category	n	Percentage (%)
Administrative Level	Headquarters	55	26.07
	State Health Departments	30	14.22
	District Health Offices	126	59.72
Grade	C41–C44	155	73.46
	C45–C48	37	17.54
	C49–C54	19	9.01
Years of Service	≤5 years	7	3.32
	6–10 years	41	19.43
	>10 years	163	77.25

Instrument Development and Pilot Study

Data were collected using a structured, self-administered questionnaire developed to measure Leadership Strategies and Food Safety Control Performance within the FSQD, MOH. The survey enabled standardized responses to be collected from officers working across different locations and was appropriate for examining relationships between organizational constructs (Creswell & Creswell, 2018; Sekaran & Bougie, 2020). The questionnaire was prepared in English and Malay to support respondents' understanding.

The questionnaire comprised two constructs measured on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Leadership Strategies were measured using 25 items covering Idealized Influence, Inspirational Motivation, Intellectual Stimulation, Individualized Consideration, and Empowering Leadership. Items for the first four dimensions were adapted primarily from Bass (1985) and Bass and Avolio (1994). The Empowering Leadership items were developed for this study following a review of the leadership literature and were worded to reflect the guidance, support, and appropriate authority officers need when exercising professional judgement within regulatory procedures. Food Safety Control Performance was measured using 12 items adapted from the organizational performance literature and contextualized to the responsibilities of the FSQD. The constructs are summarized in Table 2.

Before the main survey, the questionnaire was pilot tested with respondents who had characteristics similar to those of the target population. The pilot assessed item clarity, questionnaire structure, and internal consistency. Minor wording changes were made based on the feedback without changing the intended meaning of the items. Cronbach's alpha values exceeded the recommended threshold of 0.70 (Nunnally & Bernstein, 1994; Hair et al., 2022), indicating satisfactory internal consistency for the main survey.

Measurement of Constructs

Leadership Strategies were operationalized as a second order reflective construct comprising the four established transformational dimensions and Empowering Leadership as an additional dimension relevant to the FSQD context. Empowering Leadership refers to providing guidance, support, and appropriate authority for officers to make professional decisions within legal and procedural boundaries. Food Safety Control Performance was

operationalized as a multidimensional reflective construct based on officers' perceptions of organizational performance. This study examined Leadership Strategies as an overall construct and did not estimate the separate effect of each dimension.

Table 2. Measurement of the Study Constructs

Construct	Theoretical Foundation	Primary Source	Number of Items	Measurement Dimensions
Leadership Strategies	Transformational Leadership Theory; additional empowerment dimension for FSQD context	Four transformational dimensions: Bass (1985); Bass & Avolio (1994). Empowering Leadership items: developed for this study based on the leadership literature and FSQD regulatory context.	25	Idealized Influence; Inspirational Motivation; Intellectual Stimulation; Individualized Consideration; additional Empowering Leadership dimension
Food Safety Control Performance	Organizational Performance Theory	Adapted from organizational performance literature and contextualised to FSQD	12	Regulatory Effectiveness; Organizational Management; Teamwork; Compliance Commitment; Crisis Management; Organizational Reputation; Stakeholder Satisfaction

Data Collection Procedure

Following approval from the relevant authorities, the questionnaire was distributed to eligible Food Technology Officers within the FSQD, MOH, including officers stationed at Headquarters, State Health Departments, and District Health Offices. Participation was voluntary, and respondents were informed of the study objectives before providing informed consent. To ensure confidentiality, no personally identifiable information was collected, and all responses were treated anonymously.

Data Analysis

Data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). Preliminary analyses included data screening, descriptive statistics, and an assessment of missing values before hypothesis testing.

The measurement model was evaluated for indicator reliability, internal consistency, convergent validity, and discriminant validity following Hair et al. (2022). The structural model was then assessed using 5,000 bootstrap resamples. The path coefficient (β), t-value, p-value, and 95% confidence interval were used to assess the relationship between Leadership Strategies and Food Safety Control Performance.

As leadership and performance were measured using responses from the same officers, common method bias was assessed using Harman's single-factor test. The first factor accounted for less than 50% of the total variance, suggesting that no single factor dominated the responses. This test does not rule out all possible common-method influences.

The PLS-SEM path coefficient reported in this paper came from the broader structural model used in the original research. In that model, the relationship between Leadership Strategies and Food Safety Control Performance was estimated alongside other organizational constructs. The reported path therefore reflects the leadership relationship after accounting for those constructs.

A supplementary simple linear regression was conducted with Leadership Strategies as the sole predictor of Food Safety Control Performance. It provides an estimate of the relationship without the other predictors in the

broader model. The regression coefficient is reported as unstandardized (b), whereas the PLS-SEM path is reported as standardized β . The two analyses serve different purposes, and their coefficients should be interpreted within their respective models.

Ethical Considerations

This study was conducted in accordance with accepted ethical principles governing organizational research involving human participants. Approval to conduct the research was obtained from the relevant authorities within the Ministry of Health Malaysia prior to data collection. Participation in the study was entirely voluntary. Respondents were informed of the purpose of the research and advised that completion of the questionnaire indicated their informed consent to participate. To protect participants' privacy, no personally identifiable information was collected, and all responses were treated as strictly confidential. Data were analyzed only in aggregated form and were used exclusively for academic research purposes.

RESULTS

Respondent Profile

Table 1 shows that the majority of respondents were stationed at District Health Offices (59.72%), followed by Headquarters (26.07%) and State Health Departments (14.22%). This distribution reflects the operational structure of FSQD, where district offices constitute the primary workforce responsible for inspection, surveillance, and enforcement activities. Most respondents (77.25%) had more than 10 years of professional experience, while 73.46% were in grades C41–C44, indicating that the study captured the perspectives of officers with substantial experience in food safety governance. The diversity of respondents across administrative levels, employment grades, and years of service enhances the representativeness of the sample and strengthens the credibility of the findings.

Descriptive Statistics

Table 3 presents the descriptive statistics for the study constructs. Overall, respondents reported relatively high perceptions of both Leadership Strategies and Food Safety Control Performance. Leadership Strategies recorded a mean score of 4.210 (SD = 0.748), while Food Safety Control Performance recorded a mean score of 4.172 (SD = 0.696). The mean values above 4.0 indicate that respondents generally perceived leadership practices and organizational performance positively within the FSQD, MOH. The relatively small standard deviations suggest a reasonable level of consistency in respondents' perceptions across both constructs.

Table 3. Descriptive Statistics of the Study Constructs

Construct	Mean	Standard Deviation
Leadership Strategies	4.21	0.748
Food Safety Control Performance	4.172	0.696

Measurement Model Assessment

As presented in Table 4, both constructs demonstrate satisfactory measurement properties. Leadership Strategies achieved a Cronbach's alpha of 0.93, Composite Reliability (CR) of 0.94, and an Average Variance Extracted (AVE) of 0.62, while Food Safety Control Performance recorded a Cronbach's alpha of 0.92, Composite Reliability of 0.93, and an AVE of 0.64. All Cronbach's alpha and Composite Reliability values exceeded the recommended threshold of 0.70, indicating strong internal consistency reliability. Furthermore, the AVE values were greater than 0.50, confirming adequate convergent validity by demonstrating that each construct explained more than half of the variance in its respective indicators.

Discriminant validity was assessed using the Heterotrait–Monotrait (HTMT) ratio. As shown in Table 5, the HTMT value between Leadership Strategies and Food Safety Control Performance was 0.72, which is below the recommended threshold of 0.85. This finding confirms that the two constructs are empirically distinct and

measure separate theoretical concepts. Overall, the measurement model satisfied all recommended psychometric criteria and was therefore considered appropriate for subsequent structural model assessment.

Table 4. Measurement Model Assessment

Construct	Cronbach's Alpha	Composite Reliability	AVE
Leadership Strategies	0.93	0.94	0.62
Food Safety Control Performance	0.92	0.93	0.64

Table 5. Discriminant Validity (HTMT)

Constructs	Leadership Strategies	Food Safety Control Performance
Leadership Strategies	—	0.72
Food Safety Control Performance	0.72	—

Structural Model Assessment

As presented in Table 6, Leadership Strategies was positively and statistically significantly associated with Food Safety Control Performance ($\beta = 0.581$, $t = 9.00$, $p < .001$). The corresponding 95% confidence interval (0.454–0.707) did not include zero, further confirming the statistical significance of the relationship. These findings support Hypothesis 1, indicating that stronger leadership practices are associated with higher levels of organizational performance within the FSQD, MOH.

The structural model demonstrated substantial explanatory power, with Leadership Strategies contributing meaningfully to the prediction of Food Safety Control Performance. The positive path coefficient indicates that stronger leadership behaviors, including idealized influence, inspirational motivation, intellectual stimulation, individualized consideration, and empowering leadership, are associated with higher levels of regulatory and organizational performance.

Table 6. Structural Model Assessment

Hypothesis	Relationship	β	t-value	p-value	95% Confidence Interval	Decision
H1	Leadership Strategies → Food Safety Control Performance	0.581	9	< .001	0.454 – 0.707	Supported

Supplementary Regression Analysis

To provide a focused assessment of the relationship examined in this study, a simple linear regression analysis was conducted with Leadership Strategies as the predictor and Food Safety Control Performance as the dependent variable. The results demonstrated a strong positive and statistically significant relationship between Leadership Strategies and Food Safety Control Performance (unstandardized $b = 0.768$, $t = 21.094$, $p < .001$). Leadership Strategies explained 68.0% of the variance in Food Safety Control Performance ($R^2 = 0.680$), indicating substantial explanatory power within the focused regression model.

The regression coefficient of $b = 0.768$ is unstandardized, whereas the PLS-SEM path coefficient of $\beta = 0.581$ is standardized. The regression included Leadership Strategies as the sole predictor and accounted for 68.0% of the variance in perceived performance ($R^2 = 0.680$). The PLS-SEM path was estimated within a broader model that included other organizational constructs. Because the coefficients have different scales and come from different models, their numerical values should not be compared directly. Both analyses showed a positive and statistically significant relationship.

Table 7. Supplementary Regression Analysis

Predictor	Unstandardized b	t-value	p-value	R ²
Leadership Strategies	0.768	21.094	< .001	0.68

DISCUSSION

The study found a positive association between Leadership Strategies and officers' perceptions of Food Safety Control Performance within the FSQD, MOH. Both the PLS-SEM path and the supplementary regression were statistically significant, although they were estimated using different models. The cross-sectional, self-reported data do not establish that leadership caused an improvement in regulatory outcomes.

The findings are relevant to Transformational Leadership Theory because the study examined its four established dimensions in a public regulatory agency. Empowering Leadership was added to reflect the need to support officers' judgement within the limits of law and procedure. The overall Leadership Strategies construct was associated with perceived performance. The study did not test whether one particular leadership dimension contributed more than another.

Previous studies have also reported positive relationships between transformational leadership and organizational performance (Judge & Piccolo, 2004; Wang et al., 2011; Northouse, 2022). The present study adds evidence from a specialized food safety regulatory agency. Its performance measure, however, reflects officers' assessments rather than independently verified inspection or enforcement outcomes.

Within FSQD, leaders communicate regulatory priorities and support officers who must make decisions under legal and procedural requirements. This provides a practical context for the observed association with perceived performance. The survey cannot determine which leadership practice, if any, improves recorded enforcement outcomes.

Officers at Headquarters, State Health Departments, and District Health Offices have different responsibilities and may experience leadership differently. As their responses were analysed together, this study cannot determine whether the association varies across these levels.

Recorded regulatory outcomes could be used in future research to examine whether leadership development is associated with more consistent enforcement and improved organizational performance.

Leadership is not the only factor relevant to Food Safety Control Performance. Technical competency, available resources, technology, legislation, stakeholder cooperation, and emerging food safety risks may also influence regulatory work. The present survey does not determine the relative contribution of all these factors or establish a causal relationship.

Overall, Leadership Strategies were positively associated with officers' assessments of Food Safety Control Performance. This evidence is relevant to leadership in a national regulatory agency, while recorded outcomes and longitudinal data are needed to examine the relationship further.

THEORETICAL AND PRACTICAL IMPLICATIONS

Theoretical Implications

This study applies Transformational Leadership Theory to a public food safety regulatory agency and adds Empowering Leadership as a dimension relevant to officers who exercise professional judgement under legislation and formal procedures. The five dimensions were examined together; their separate relationships with performance remain for future study.

Leadership development in a regulatory agency should support officers while maintaining clear standards and accountability. This balance is relevant to the FSQD's work, although the present survey cannot show whether a particular leadership practice directly improves performance.

Practical and Policy Implications

Leadership development should be institutionalized within FSQD and similar public regulatory agencies. Training should not focus only on technical food safety competency but should also strengthen strategic communication, decision-making under risk, team motivation, conflict management, stakeholder coordination, and change leadership. Clear regulatory direction should be communicated consistently from headquarters to state and district levels. Leaders should ensure that policies, standard operating procedures, enforcement priorities, and performance expectations are understood in the same manner across all administrative levels.

Empowering leadership should be strengthened by giving competent officers appropriate authority, technical guidance, and management support when dealing with complex enforcement matters. Empowerment does not mean removing control; it means providing officers with the confidence and institutional backing required to exercise professional judgment within legal and procedural boundaries. Leadership performance should be incorporated into organizational performance management. Indicators may include the quality of communication, support for officer development, consistency of decision-making, effectiveness of inter unit coordination, responsiveness during food safety incidents, and the ability to build staff commitment. Succession planning is also important. Experienced officers should be prepared for leadership roles through mentoring, rotational exposure, strategic assignments, and formal leadership development. This would help maintain leadership continuity and reduce differences in regulatory performance across administrative levels.

LIMITATIONS AND FUTURE RESEARCH

This study has several limitations that should be considered when interpreting the findings. First, the study employed a cross-sectional research design, with data collected at a single point in time. Although the findings demonstrate a significant positive relationship between Leadership Strategies and Food Safety Control Performance, the cross-sectional design limits the ability to establish causal relationships or determine how leadership effects may change over time. Future studies could employ longitudinal research designs to examine the longer-term effects of leadership on regulatory performance.

Second, leadership and performance were assessed by the same officers. Although the first factor in Harman's single-factor test accounted for less than 50% of the total variance, shared perceptions and common-method influences cannot be ruled out. Future studies could draw on separate sources and recorded regulatory-performance indicators, including inspection outcomes, compliance records, enforcement consistency, and incident response.

Third, the study included Food Technology Officers from one Malaysian regulatory agency. Laboratory personnel, other regulatory stakeholders, industry representatives, and consumers were not surveyed. Their perspectives may differ, and the findings should not be generalized to these groups without further research. Future studies could therefore include perspectives from laboratory personnel, regulated industries, and other relevant stakeholders. Comparisons with other regulatory agencies and countries may also provide useful insights.

Finally, Leadership Strategies were examined as an overall construct. Future research could examine the five dimensions separately, including whether Empowering Leadership adds to the four established transformational dimensions. Comparative analysis across Headquarters, State Health Departments, and District Health Offices could also identify possible variations in leadership effectiveness. Longitudinal data, recorded regulatory-performance indicators, and interviews may further help explain how leadership practices relate to officers' decisions and regulatory outcomes over time.

CONCLUSION

This study found a positive association between Leadership Strategies and officers' perceptions of Food Safety Control Performance among 211 Food Technology Officers in the FSQD, MOH. The PLS-SEM path was $\beta = 0.581$ ($p < .001$), while the supplementary regression yielded an unstandardized coefficient of $b = 0.768$ ($p < .001$). These coefficients were estimated on different scales and in different models.

The findings add evidence on leadership within a public food safety regulatory agency. They also highlight the need to support professional judgement within legal and procedural requirements. Because the study was cross-sectional and based on self-reported performance, further research should examine the leadership dimensions separately and assess their relationship with recorded outcomes over time.

REFERENCES

1. Baldrige Performance Excellence Program. (2023). Baldrige excellence framework (Leadership and management practices). National Institute of Standards and Technology.
2. Bass, B. M. (1985). Leadership and performance beyond expectations. Free Press.
3. Bass, B. M., & Avolio, B. J. (1994). Improving organizational effectiveness through transformational leadership. Sage.
4. Bass, B. M., & Riggio, R. E. (2006). Transformational leadership (2nd ed.). Psychology Press.
5. Burns, J. M. (1978). Leadership. Harper & Row.
6. Codex Alimentarius Commission. (2023). General principles of food hygiene (CXC 1-1969). FAO/WHO.
7. Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). Sage.
8. Deming, W. E. (1986). Out of the Crisis. MIT Press.
9. Denhardt, J. V., & Denhardt, R. B. (2015). The new public service: Serving, not steering (4th ed.). Routledge.
10. EFQM. (2020). The EFQM Model. European Foundation for Quality Management.
11. Food and Agriculture Organization of the United Nations, & World Health Organization. (2022). Food safety aspects of sustainable food systems. FAO.
12. Food Safety and Quality Division. (2024). Annual report 2024. Ministry of Health Malaysia.
13. García-Morales, V. J., Lloréns-Montes, F. J., & Verdú-Jover, A. J. (2008). The effects of transformational leadership on organizational performance through knowledge and innovation. *British Journal of Management*, 19(4), 299–319.
14. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). A primer on partial least squares structural equation modeling (PLS-SEM) (3rd ed.). Sage.
15. Ishak, N. A., Kamsani, N. A., & Salleh, M. M. (2019). Food hygiene knowledge and practices among food handlers in Malaysia. *International Journal of Environmental Health Research*, 29(5), 567–580.
16. Judge, T. A., & Piccolo, R. F. (2004). Transformational and transactional leadership: A meta-analytic test of their relative validity. *Journal of Applied Psychology*, 89(5), 755–768.
17. Kamsani, N. A., Salleh, M. M., & Ishak, N. A. (2022). Compliance behaviour among food premises operators in Malaysia. *Journal of Food Safety*, 42(3), e12979.
18. Ministry of Health Malaysia. (1983). Food Act 1983 (Act 281). Government of Malaysia.
19. Ministry of Health Malaysia. (1985). Food Regulations 1985. Government of Malaysia.
20. Ministry of Health Malaysia. (2009). Food Hygiene Regulations 2009. Government of Malaysia.
21. Northouse, P. G. (2022). Leadership: Theory and practice (9th ed.). Sage.
22. Nunnally, J. C., & Bernstein, I. H. (1994). Psychometric theory (3rd ed.). McGraw-Hill.
23. Oakland, J. S. (2014). Total quality management and operational excellence: Text with cases (4th ed.). Routledge.
24. OECD. (2017). Government at a Glance 2017. OECD Publishing.
25. OECD. (2023). Government at a Glance 2023. OECD Publishing.
26. Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903.
27. Rainey, H. G. (2014). Understanding and managing public organizations (5th ed.). Jossey-Bass.
28. Sekaran, U., & Bougie, R. (2020). Research methods for business: A skill-building approach (8th ed.). Wiley.
29. United Nations. (2023). World Public Sector Report 2023. United Nations.
30. Unnevehr, L. (2015). Food safety in developing countries: Moving beyond exports. *Global Food Security*, 4, 24–29.
31. Van Wart, M. (2017). Dynamics of leadership in public service: Theory and practice (2nd ed.).

Routledge.

32. Wang, G., Oh, I.-S., Courtright, S. H., & Colbert, A. E. (2011). Transformational leadership and performance across criteria and levels: A meta-analytic review of 25 years of research. *Group & Organization Management*, 36(2), 223–270.
33. World Health Organization. (2022). WHO global strategy for food safety 2022–2030: Towards stronger food safety systems and global cooperation. World Health Organization.
34. Yukl, G. (2013). *Leadership in organizations* (8th ed.). Pearson.