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Blockchain Applications in Supply Chains and Intermodal Transportation

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1. Introduction

For several years, blockchain has been lauded as the next great transformational technology that will revolutionize peer-to-peer transactions, data storage, and more. A blockchain is a distributed and immutable ledger tracking transactions and exchanges between participants. Data in a blockchain are stored chronologically in blocks linked by a cryptographic hash function (CHF), or "chain." While blockchain's first use was as the technology underlying cryptocurrencies such as Bitcoin and Ethereum, the number of applications for the technology has increased substantially in recent years. Despite the numerous technological aspects present in a functioning blockchain, the motivation for adopting the technology is straightforward. In addition to open access, immutability, and the absence of a third-party intermediary, the advantages of blockchain include smart contracts, which store rules and policies for negotiating terms between parties and automatically verify that each party has met contractual obligations (Li et al., 2020).[1]

Among those who have embraced blockchain technology are the transportation, logistics, and supply chain industries. Blockchain's applicability to transportation-related industries includes the development of intelligent transportation systems (ITS), road traffic management, "smart city" functions, electric vehicles, and traceability in the supply chain (Astarita et al., 2020). These new mobility paradigms and the implementation of blockchain into existing transportation and supply chain systems allow both private and public sector actors to streamline operations, implement transformational technologies, and embrace new methods of governance with greater agility. The supply chain and logistics industries in particular have sought to implement blockchains because they are global and intermodal—requiring multiple modes of

[1] In this paper, "blockchain" refers to public blockchains. For more information on the differences between public and private (or "permissioned") blockchains, see Hanebeck et al. (2018).

transport—by nature. Cooperation, transparency, and the reduced reliance on paper- and human-based processes for data storage and tracking have the potential to drastically reduce costs and improve efficiency among actors in these industries.

The rest of this white paper is structured as follows: Section 2 includes a background of blockchain technology, the economic theory supporting the technology, its advantages and disadvantages, and obstacles to adoption, Section 3 includes blockchain's applications to the supply chain, including case studies from Maersk and IBM as well as maritime transport of food products, Section 4 includes insights to blockchain's role in shaping the new economy beyond the COVID-19 pandemic, and Section 5 concludes.

2. Blockchain Background and Importance as a Disruptive Technology

2.1 Blockchain Background

A blockchain is a single secure, immutable, and transparent ledger that can post transactions almost instantaneously. Blockchains are comprised of time-stamped transactions grouped together in blocks, with each "chain" connecting new blocks to previous blocks through CHFs. Although it is not exclusively used in blockchain settings, cryptography is a fundamental feature that allows actors to add blocks and conceal sensitive information. To mitigate dishonesty among miners, blockchains rely on consensus mechanisms, the most common of which is proof-of-work (PoW). Under PoW, cryptographers—also called "miners"—use CHFs to add and safeguard new transactions to the blockchain. In return, miners are usually rewarded with cryptocurrency. (Warren et al., 2018) Blockchains are append-only, meaning that verified transactions are added to the first block—also called the "genesis" block—and all previous blocks in chronological order (Nofer et al., 2017). Moreover, blockchains are immutable, meaning that miners cannot remove verified entries.

The distributed structure blockchains use ensures security and efficiency. Traditionally, third-party intermediaries such as social networks, payments processors, banks, governments, and others create value by storing information and facilitating transactions and the flow of information, assets, and currency. However, these trusted authorities often impose transaction costs, collect consumer data, and rely on centralized servers that are "vulnerable to crashes, fraud, and hacks" (Tapscott and Tapscott, 2017). Blockchain technology mitigates these problems since it relies on a multitude of authorized computers ("nodes") and miners who record data, hence its decentralized (or "distributed") organization. While it is theoretically possible for nefarious miners and hackers to corrupt a blockchain, establishing consensus among potentially thousands of nodes is infinitely more difficult than attacking a single intermediary's central database. Plus, users can view the blockchain's original contents at any time as well as new blocks at the same time as everyone else because of blockchain's distributed structure.

2.2 Advantages and Disadvantages to Blockchain

Using blockchain has many advantages over traditional centralized ledgers in addition to the aforementioned benefits of security, open access, transparency, immutability, and consensus. In industries like transportation, for example, blockchain enables Internet-of-Things (IoT) technology—which involves the use of devices to communicate with each other through the Internet and provide large amounts of real-time data—where it would otherwise be unavailable, ineffective, or inefficient (Yuan and Wang, 2016). Also, blockchains enable smart contracts, which are "software programs that store rules and policies for negotiating terms and actions between parties" and can "automatically verify that contractual terms have been met and execute transactions" (Saberi et al., 2019). Automating contracts, regulations, policies, and other through smart contracts could lead to greater efficiency, reduce risk, and lower operational costs.

Despite blockchain's favorable characteristics, it has several shortcomings. First, blockchain is a nascent technology and knowledge of its potential value and applications is not widely known. Blockchains are technologically sophisticated and many potential users may be hesitant to embrace the technology. A lack of knowledge and expertise and financial constraints are additional intra-organizational barriers. Inter-organizational differences such as cultural differences between actors within an industry exist as well. Similarly, blockchain technology is not yet adequately regulated, which poses concerns for current users. Next, blockchain use is environmentally harmful since mining through PoW requires a tremendous amount of computational power. These costs may lead to more barriers to entry. Furthermore, although blockchains are distributed, they might not be scalable, which would lead to slower processing of new blocks. Compared to powerful intermediaries, blockchains process fewer transactions for any unit of time. Lastly, blockchains have privacy concerns—users may object to the publication of some information on unalterable public blockchains (Gatteschi et al., 2018).

2.3 Economic Theory Supporting Blockchain

Economic theory contains additional insights that explain how and why blockchain technology is poised to disrupt conventional digital platforms. For example, blockchain reduces two types of costs: verification and networking. To verify and facilitate transactions between buyers and sellers, intermediaries "add value to marketplaces by reducing information asymmetry and the risk of moral hazard" as outlined in Section 2.1 (Catalini & Gans, 2019). With blockchains, however, the costs associated with verification (as well as the premia intermediaries charge when they have market power) become negligible. Similarly, blockchains have network effects. As more people and organizations use blockchain, switching costs decrease and adoption over time becomes nonlinear (Davidson et al., 2016). Over time, decentralized ledgers will exhibit economies of scale since the cost of processing digital information decreases by half every year and a half (Moore's law), the cost of storing information digitally decreases by half every year (Kryder's law), and the cost of bandwidth decrease by half every two years (Nielsen's law) (Wiles, 2015).

Blockchain is perhaps best understood as a new kind of general purpose technology (GPT) due to its potentially pervasive effects (MacDonald et al., 2016). To fit the GPT classification, which includes the Internet, electricity, and double-entry bookkeeping, blockchain must display pervasiveness, improvement, and be innovation-spawning (Bresnahan and Trajtenberg, 1995). Since blockchain has applications that can be—and increasingly are—present in various industries, lower transaction and other costs, and offer a decentralized solution to traditional ledgers, it can bring productivity growth and permeate the macroeconomy. These benefits exist because blockchain is a solution to the double-spend problem, or the possibility that owners of digital currency use the same money twice. Traditional digital exchanges and transactions occur when one party sends copies of documents to others. However, this system does not work well with digital asset exchanges. With blockchain, people and organizations can receive money from others while being confident that the sender cannot send the same money to others and that they will be able to use the money in other transactions.

3. Blockchain in the Supply Chain

3.1 Overview of Blockchain's Relevance to Supply Chains

Among the industries where blockchains can have the greatest impact and create the most value are logistics and supply chain.[2] Blockchain is a possible solution to many problems that hinder these industries—including a heavy reliance on loss- and tamper-prone paperwork,

[2] For a more detailed survey on blockchain applications in transportation, see Astarita et al. (2020).

counterfeit products, and food-borne illnesses (Hackius and Petersen, 2017). Tracking goods movement, preventing disruptions, and increasing transparency are increasingly important since supply chains are growing more sophisticated and globalized. Meanwhile, "relying on one single organization to broker such sensitive and valuable information requires a great deal of trust to be invested by each actor in the supply chain" (Abeyratne and Monfared, 2016). Four different types of entities comprise supply chain-specific blockchains: registrars—who provide actors with unique identities—, standards organizations—who outline standards like Fairtrade—, certifiers—who provide certifications to participants that permit participation—, and actors—producers, distributors, retailers, and consumers (Steiner and Baker, 2015).

Interestingly, some of blockchain's qualities that make it suitable for the supply chain management industry are obstacles. For example, outside of single-use cases such as tracking internal transport and fleet and vehicle performance history, aligning the numerous stakeholders with varied levels of expertise and technological prowess to take up blockchain and create the necessary "critical mass" to enjoy network effects is a difficult task. According to a survey of supply chain and logistics companies, regulatory uncertainty is the primary perceived barrier to adoption, followed by the requirement of multiple parties to use the technology, the technology's immaturity, and the lack of current users (Petersen et al., 2017). Nevertheless, existing blockchain uses indicate that there is the capacity for utilization.

3.2 Case Study: Maersk and IBM

Perhaps the best-known and most promising case of blockchain's use among supply chain actors is the partnership between shipping company Maersk and IBM. This partnership originated from a desire to combat the inefficiencies and burdensome costs associated with maritime shipping, which carries more than 80% of consumer goods at some point in the supply chain (Aitken, 2018). In particular, the two companies seek to eliminate silos that conceal critical shipping information, reduce reliance on time-consuming manual processes and delays, and simplify and improve operations and customer services. Together, Maersk and IBM created TradeLens, a digital platform. By the end of 2018, the platform contained more than one million new shipping events per day, a number that increased to more than two million by the end of 2019 (TradeLens).

Since TradeLens' pilot phase, the ecosystem has grown steadily in terms of organizations and the share of total trade volume represented on the platform. The TradeLens ecosystem initially included stakeholders from across the entire supply chain—more than 20 port and terminal operators from East Asia to the United States, claims authorities, beneficial cargo owners (BCOs), and freight forward and logistics companies (IBM, 2018). As of September 2019, the TradeLens ecosystem had grown to include more than 100 organizations, including 55 ports and terminals, including major shipping lines CMA CGM, MSC, Hapaq-Lloyd, and Ocean Networks Express. From these actors, TradeLens contains data from up to 600 ports and terminals worldwide and TradeLens records data from nearly two thirds of global container volumes. The participation of almost a dozen customs authorities as permissioned actors allows shippers, ports and terminals, and others to comply with regulations and secure customs clearance without difficulty (Maersk article at end of doc).

In the two years since TradeLens' inception, the platform has spread its geographic reach. Starting in 2020, Bimal Kanal—Director of GTD Solution Inc., West Central Asia—joined TradeLens to bring new participants to the blockchain. The area where Kanal works is increasingly important to global trade and includes India, a country with expanding trade networks (TradeLens, 2020). According to a study from consulting firm QBIS, TradeLens could save importers using Nhava Sheva—India's second-largest port—$220 million annually by using digitized documentation and utilizing TradeLens' transparent processes. Nationwide, these savings are estimated to reach $860 million. In addition, TradeLens is estimated to roughly halve the average time of import documentation—from 67 hours to 35 hours—and dwell times—from 85 hours to 49 hours. Further, TradeLens could reduce customs assessments costs by 4% and inspection costs by 11%. Plus, TradeLens is estimated to reduce both the direct and indirect cost of rollings (missed scheduled vessels) by 23% (Westergaard-Kabelmann, 2019). These developments may allay fears over the potential lack of scalability and network effects for blockchain to have a comparative advantage over alternatives.

The TradeLens platform involves collaboration from all supply chain actors to run the blockchain. Shippers can send shipping instructions to carriers who in turn produce bills of lading that are accessible to customs brokers, ports/terminals, and, finally, the owner of the shipment who receives the shipments. Between the origin and destination, freight forwarders, ocean carriers, third-party logistics (3PL) providers, and more contribute real-time shipping information and data to the blockchain. Once a milestone in the shipping process is published on the blockchain, all others can view the update. This feature has the added benefit of making the supply chain more responsive to alterations in shipments' itineraries. For example, if a shipper in China reroutes a shipment from the western United States to the eastern United States, they simply record a different bill of lading via blockchain, which is accessible to all permissioned parties and searchable on the TradeLens platform based on booking number, bill of lading number, equipment number, or delegation ID. (Ibid.). As well as being more innovative and efficient, TradeLens cultivates trust between actors.

3.3 Case Study: IBM's Food Trust

In addition to TradeLens, IBM has partnered with Walmart to implement blockchain technology and make the food supply chain safer and more efficient, traceable, and transparent. Like container goods, the food supply chain has inefficiencies that negatively impact the industry and that blockchain could potentially solve. Almost simultaneously with TradeLens, IBM initiated their Food Trust project, which involves partnering with some of the world's largest food suppliers including Walmart, Dole, Tyson Foods, McCormick and Company, and Kroger to use blockchain. As well as reducing reliance on paper-based processes, actors in the food supply chain use blockchain to track expiration dates and better track food waste that costs the industry $150 billion each year (IBM, 2018a). According to the World Health Organization, approximately 600 million people around the world become sick from eating contaminated food and 425,000 die each year (WHO, 2015). Currently, identifying failures in the supply chain leading to recalls could take weeks given the complicated web of suppliers and distributors (IBM, 2018b). Such delays cause more people to fall ill while the industry loses money and experiences more waste. These issues are particularly important to the food industry since people are more likely now to seek food that was produced sustainably and are willing to switch brands following recalls (IBM, 2018c).

Just like TradeLens, IBM's Food Trust works by decentralizing information and permitting the myriad participants in the supply chain to track and identify each stage of the food production, warehousing, and shipping processes. For example, Mediterranean olive oil producer CHO announced on January 14, 2020 that it began using IBM's blockchain platform to trace its Terra Delysa extra virgin olive oil. With blockchain, CHO is able to trace oil production and shipment from orchards in Tunisia where olives are grown to consumers in Canada, the United States, Germany, France, Denmark, and Japan. Consumers who purchase bottles of Terra Delysa extra virgin olive oil. Every bottle has a QR code consumers can scan to view the oil's entire provenance record. This information is valuable in the olive oil market where an estimated half of all olive oils have misleading labels. Blockchain is a valuable tool to ensure that the market for products like extra virgin olive oil—which is higher quality and healthier than other olive oils—function properly and that consumers purchase the products they want at the quality they demand (IBM, 2020).

The market for raw seafood—another specialty product that requires a specific quality like CHO's Terra Delysa olive oil—has also benefited from IBM's blockchain infrastructure. For roughly a century, fishermen in New Beford, Massachusetts have caught scallops and comprised more than 85% of the United States' scallop market. The raw seafood market has been plagued by overfishing, mislabeling—as many as one out of every five fish products are mislabeled—, and complexity. This chain begins once the fishermen catch scallops and use the printers and scales on shore to record data from their catch. Just as CHO can verify and communicate that it produces extra virgin olive oil, fisheries are able to reliably provide types of fish that command higher prices and consumers demand. Since more than 80% of American seafood is imported from other countries, people in the United States can also trust that the seafood they buy has been properly caught, handled, and shipped without overpaying, consuming a different product than they want, and risking their health.

3.4 Intermodal Transportation with Blockchain

Blockchains help supply chains through decentralized bills of lading and letters of credit since supply chains are fragmented, global, involve various actors, and intermodal transportation—transportation using multiple different carriers in a single journey. Intermodal transport offers advantages such as standardization, flexibility, economies of scale, and faster shipment, but comes with disadvantages like the complexity, repositioning, and more. Bills of lading are essential documents because they include the roles and liabilities each actor and carrier in the supply chain assumes. Although electronic bills of lading were introduced in the 1980s, they still required management by third-party intermediaries. Blockchains also integrate and automate letters of credit. Letters of credit are issued by financial institutions and indicate promises of payment and can be executed through smart contracts in a blockchain. Examples where these contracts include instances of demurrage costs (delays in proof of payment due to the expiration of dwell times (Rodrigue, 2020).

Data and information transparency run smoothly with blockchain. Truck carriers issue bills of lading once they pick up containers from distribution centers and append the blockchain with information on equipment, tolls, drivers, and any other notable events. This information can be gathered from sensors, devices, and other IoT technology. Depending on the product, specialized data is included. For example, seafood from New Bedford, Massachusetts or produce that will be sold at Walmart stores may include thermometers to ensure that they maintain the proper temperature to prevent spoilage. Next, ports add other relevant information on the container, such as the terminal gate the container leaves, yard storage location, and customs clearance status. The container must clear customs as it reaches the port of destination, a process blockchain also automates if customs authorities are included in the blockchain. Land carriers—rail or truck carriers—bring the container to final distribution centers, and last mile haulage, similar information fills out the blockchain and smart contracts are executed to pay suppliers—shipping liners, terminal operators, and truck carriers (Rodrigue, 2018).

4. Blockchain in the Post-COVID-19 World

The COVID-19 pandemic has disrupted the global economy in many ways. In particular, the crisis has shaken global supply chains and exposed the industry's weaknesses. While relatively few organizations have switched to blockchain, the "new normal" that will emerge in the aftermath of the COVID-19 pandemic may serve as a critical juncture that leads to widespread adoption. In the meantime, blockchain could assist in the recovery process by helping hospitals and health care workers receive PPE, grocers obtain food, and more. In fact, Norwegian fish producer Kvarøy Arctic joined the more than 300 suppliers and buyers currently on IBM's Food Trust, citing a surge in demand from the U.S. during the pandemic (Anzalone, 2020). Once economic activity resumes, blockchain could restore trust in the supply chain, combat siloing, rescale operations through blockchain's cost-saving capabilities, and perhaps prevent future outbreaks through streamlined processes and transparent data (Hewett et al., 2020).

5. Conclusion

Blockchain technology is a nascent technology that has the potential to change how people and organizations share information and conduct transactions. Blockchains are digital ledgers whose contents are stored in data blocks and are virtually "chained" together through cryptographic hash functions. The first notable use of blockchain technology was supporting the platforms of cryptocurrencies. Aside from these public (or permissionless) blockchains, many of the largest companies have discovered that private (or permissioned) blockchains can be valuable in industry, particularly because of the transparency, traceability, and paperless data storage blockchains enable.

In the supply chain and logistics industries, blockchains could potentially save millions of dollars while instilling greater trust among consumers, organizations, and even customs authorities. For example, IBM partnered with global shipping company Maersk to develop TradeLens, an interconnected ecosystem of various supply chain actors powered by blockchain technology. Also, IBM initiated its Food Trust, a blockchain platform for the food supply chain. Since these industries are globalized and involve an interconnected web of suppliers, distributors, government authorities, and intermodal transportation, blockchain's features have begun to curtail inefficiencies these groups face. As the global supply chain and logistics industries grapple with the COVID-19 pandemic, some companies have recognized its value. The aftermath of this global crisis will determine whether people and organizations have the capacity, infrastructure, knowledge, and expertise necessary to adopt blockchain technology.

6. References

Anzalone, R. (2020, June 4). *IBM Blockchain is Growing in the Food Industry During Covid-19*. Forbes. Retrieved from https://www.forbes.com/sites/robertanzalone/2020/06/04/ibm-blockchain-technology-is-growing-in-the-food-industry-during-covid-19/#2c1ce7c17f07

Astarita, V., Giofré, V. P., Mirabelli, G., & Solina, V. (2020). A Review of Blockchain-Based Systems in Transportation. *Information* 11(1): 21.

Bresnahan, T. F., & Trajtenberg, M. (1995). General Purpose Technologies 'Engines of Growth'? *Journal of Econometrics* 65(1): 83-108.

Catalini, C., & Gans, J. S. (2016). *Some Simple Economics of the Blockchain* (NBER Working Paper 22952). Retrieved from National Bureau of Economics Research website: http://www.nber.org/papers/w22952.

Gatteschi, V., Lamberti, F., Demartini, C., Pranteda, C., & Santamaria, V. (2018). To Blockchain or Not to Blockchain: That is the Question. *IT Professional* 20(2): 62-74.

Hackius, N., & Petersen, M. (2017). Blockchain in Logistics and Supply Chain: Trick or Treat? In *Digitalization in Supply Chain Management and Logistics: Smart and Digital Solutions for an Industry 4.0 Environment. Proceedings of the Hamburg International Conference of Logistics (HICL), Vol. 23*: 3-18. Berlin: epubli GmbH.

IBM. (2018a). *Focus on Supply Chain Efficiencies.* https://www.ibm.com/downloads/cas/LR8VR8YV

IBM. (2018b). *Focus on Food Safety.* https://www.ibm.com/downloads/cas/ZN9EWKRQ

IBM. (2018c). *Focus on Brand Trust.* https://www.ibm.com/downloads/cas/JDKYEKD5

IBM. (2020). *Blockchain Use Cases.* Retrieved from https://www.ibm.com/blockchain/use-cases/)

Li, X., Jiang, P., Chen, T., Luo, X., & Wen, Q. (2020). A Survey on the Security of Blockchain Systems. *Future Generation Computer Systems* 107 (June 2020): 841-853.

Maersk. (2019, September 20). A Game Changer for Global Trade. Retrieved from https://www.maersk.com/news/articles/2019/09/20/a-game-changer-for-global-trade

McQuade, D. (2019, October 17). Blockchain-Traced Seafood: Helping Historic New England Fisheries Thrive. IBM. Retrieved from https://www.ibm.com/blogs/blockchain/2019/10/blockchain-traced-seafood-helping-historic-new-england-fisheries-thrive/?utm_medium=OSocial&utm_source=Youtube&utm_content=000026VK&utm_term=10008219&utm_id=Food+Trust+Raw+Seafoods+-

+A+matter+of+Trust+Description&cm_mmc=OSocial_Youtube-_-Blockchain+and+Strategic+Alliances_Blockchain-_-WW_WW-_-Food+Trust+Raw+Seafoods+-+A+matter+of+Trust+Description&cm_mmca1=000026VK&cm_mmca2=10008219

Nofer, M., Gomber, P., Hiz, O., & Schiereck, D. (2017). Blockchain. *Business & Information Systems Engineering* 59(3): 183-187.

Petersen, M., Hackius, N., & von See, B. (2017). Mapping the Sea of Opportunities: Blockchain in Supply Chain and Logistics. *Kühne Logistics University, Hamburg*.

Rodrigue, J. P. (2018). Efficiency and Sustainability in Multimodal Supply Chains. *International Transport Forum Discussion Papers*. Paris: OECD Publishing.

Rodrigue, J. P. (2020). *The Geography of Transport Systems (5th ed.)* New York: Routledge.

Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain Technology and its Relationship to Sustainable Supply Chain Management. *International Journal of Production Research* 57(7): 2117-2135.

Tapscott, D., & Tapscott, A. (2017). How Blockchain Will Change Organizations. *MIT Sloan Management Review* 58(2): 10-13.

TradeLens. (2020, June 24). TradeLens Facilitates Digitization in India. Retrieved from https://www.tradelens.com/post/tradelens-facilitates-digitization-in-the-indian-subcontinent

Wang, S., & Qu, X. (2019). Blockchain Applications in Shipping, Transportation, Logistics, and Supply Chain. In: Qu X., Zhen, L., Howlett, R., Jain, L. (eds). *Smart Transportation Systems 2019*. Smart Innovation, Systems and Technologies, vol. 149. Singapore: Springer.

Yuan, Y., & Wang, F.Y. (2016). Towards Blockchain-Based Intelligent Transportation Systems. IEEE 19th International Conference on Intelligent Transportation Systems, Rio de Janeiro, Brazil (2663-2668).

Warren, S., Wolff, C., & Hewett, N. (2018). *Inclusive Deployment of Blockchain for Supply Chains: Part 1—Introduction* [White Paper]. World Economic Forum. Available at: http://www3.weforum.org/docs/WEF_Introduction_to_Blockchain_for_Supply_Chains.pdf (link as of July 1, 2020).

Warren, S., & Hewett, N. (2018). *Inclusive Deployment of Blockchain for Supply Chains: Part 3—Public or Private Blockchains—Which One is Right for You?* [White Paper]. World Economic Forum. Available at: http://www3.weforum.org/docs/WEF_Inclusive_Deploymentof_Blockchain_for_Supply_Chains.pdf (link as of July 6, 2020).

Westergaard-Kabelmann, T. (2019, November 7). Mumbai Transport Study Highlights TradeLens Value. TradeLens. Retrieved from https://www.tradelens.com/post/mumbai-transport-study-highlights-tradelens-value

World Health Organization. (2015, December 3). WHO's First Global Estimates of Foodborne Diseases Find Children Under 5 Account for Almost One Third of Deaths. Retrieved from https://www.who.int/en/news-room/detail/03-12-2015-who-s-first-ever-global-estimates-of-foodborne-diseases-find-children-under-5-account-for-almost-one-third-of-deaths.