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Novel methods for an interesting time: Exploring U.S. local food systems' impacts and initiatives to respond to COVID*

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The COVID-19 pandemic and associated public health and social distancing mandates caused unprecedented shifts and disruptions for local and regional food systems (LRFS). The pandemic also brought new and heightened attention to the structure and resiliency of US food systems, and LRFS appeared to be positioned to significantly increase the scope and scale of their market reach as a result. Researchers from three universities collaborated with staff from the U.S. Department of Agriculture's Agricultural Marketing Service to recruit leaders from sixteen key coalitions within the U.S. LRFS sector to frame an adaptive, community-driven set of applied research activities to understand important themes, learn from effective responses and gain insights into how local and regional supply chains may change post-pandemic. In this paper, we summarise urgent and emergent strategies and innovations from LRFS captured in a fall 2020 consumer survey, with additional insights on how the survey was framed and interpreted, considering synthesis of collaborative discussions and project team interactions. We conclude the article with a set of research, policy and technical assistance priorities that were identified and validated by this LRFS network.

Key words: consumer demand, COVID-19, direct-to-consumer markets, e-commerce, food policy, local and regional food systems.

1. Introduction

The COVID-19 pandemic and associated public health mandates caused unprecedented shifts and disruptions for local and regional food systems (LRFS). Impacts on farm enterprises, value chain stakeholders, market

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channels and food system infrastructure were both vast and varied, and they required rapid adaptation by all involved. The pandemic also brought new and heightened attention to the structure and resiliency of United States (U.S.) food systems. LRFS significantly increased the scope and scale of their market reach by rapidly innovating and adapting to emerging, localised gaps in food systems.

The sudden onset of COVID-19 prompted the U.S. Department of Agriculture, Agricultural Marketing Service (USDA AMS) to pivot its focus from mid- to long-term strategic development through indirect support (e.g. grants, sector-level research) to a more deliberate, sector-guided effort to provide real-time analysis and support, including targeted technical assistance related to COVID-related relief and enhanced grant programs. USDA AMS, in partnership with a research and technical assistance team led by the University of Kentucky, enriched existing efforts across LRFS by partnering with national-level organisations and communities of practice (ultimately labelled the community of practice coordinating organisations or COPCOs) that provide essential applied research and outreach support to local food producers in the United States. This project partnership – though national in purview, resources and analytic expertise – was designed to take a 'from the ground up' approach that listened to and learned from individuals and businesses as they were adapting to COVID-19. By analysing these experiences, documenting examples of generalisable innovations, and elevating stories of adaptation, we created resources and technical assistance (TA) to assist LRFS in their COVID-19 response.

This structure also established a real-time feedback mechanism between the USDA and LRFS practitioners that allowed for a better understanding of the true impacts and needs related to the utilisation of stimulus funds (i.e. the Coronavirus Aid, Relief and Economic Security Act, CARES Act) and related food programs (i.e. the Farmers to Families Food Box Program). The ability to quickly receive feedback in this way allowed the USDA to adapt programs, allocate funding and provide technical assistance as the pandemic presented evolving challenges and revealed critical weaknesses throughout the food system. Some concerns identified through this process included the need to address issues relating to inclusion, diversity and the equitable distribution of both funding and emergency food response; necessary investments in infrastructure development, particularly for meat processing; and justification to identify farmers markets, value chains and other LRFS businesses as essential businesses.

In addition to the consumer survey we focus on in this article, through this collaborative and adaptive research process, the project team launched a virtual resource hub, conducted listening sessions, convened monthly cross-sector meetings, published innovation briefs (see sidebars 1, 2 and 4) and individual sector snapshots, hosted monthly webinars (see sidebar 3), fostered new cross-sector collaborations, and centred issues of equity and access for stakeholders across LRFS – all with the aim of supporting long-term

prosperity and resilience for LRFS. Figure 1 provides additional details on the activities undertaken as part of the project.

The contributions of the paper and the focus of this research are unique in that they build on a variety of food system literature (market access, consumer behaviour, food security and sovereignty), with the unique angle of using the COVID-19 pandemic as a means to identify gaps in the food system literature. Of particular interest, serving as a motivation to our participatory approach, is the persistent disconnect that remains across food system 'sectors' and issues and the co-creation needed between food supply chain practitioners, applied researchers and outreach professionals to understand and inform policy and programs moving forward.

While this paper is focused on US-based LRFS responses to COVID-19, the pandemic provided the context to reflect on (i) the evolution of food system structures and consumer food acquisition strategies, (ii) the persistence of food access issues and their intersection with various inequalities and

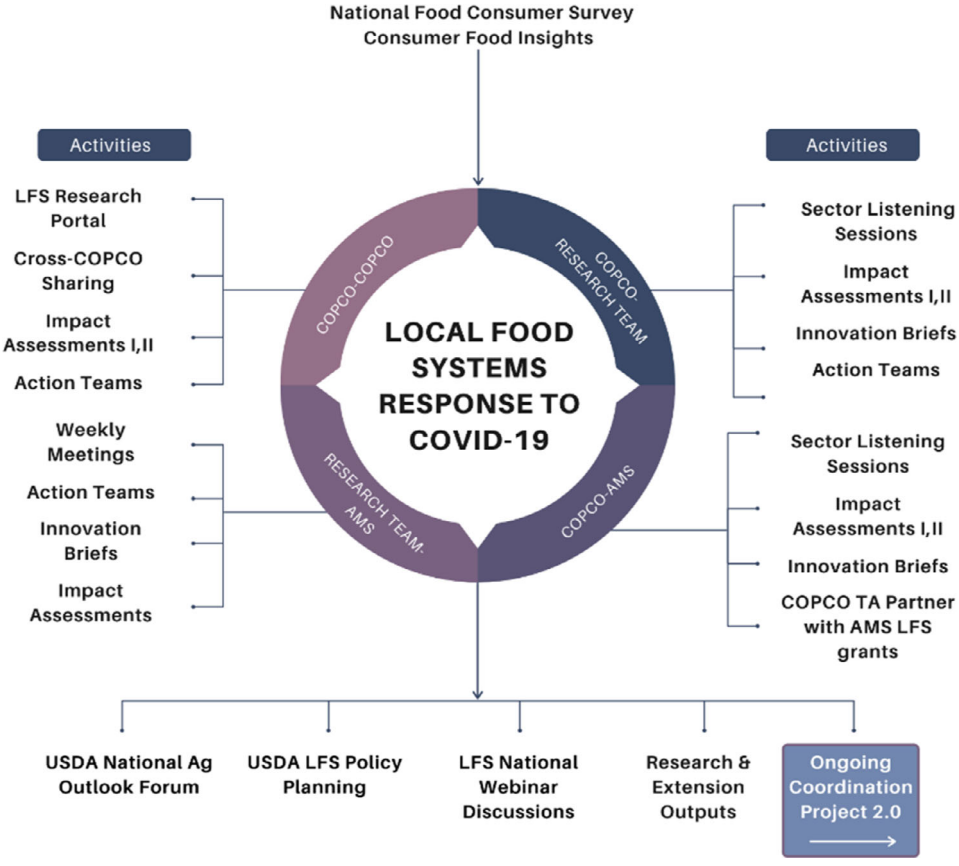

Figure 1 Overview of the U.S. Department of Agriculture's Agricultural Marketing Service-funded project on Local Food Systems Response to COVID-19. [Colour figure can be viewed at wileyonlinelibrary.com]

(iii) areas of potential vulnerability and resilience in different types of food systems. While varying by geography and sector, food systems in a globalised, interconnected world tend towards specialisation, centralisation, commodification and technological intensification. COVID-19 – with its associated breakdowns in supply chains – has revealed the vulnerability of over-reliance on long-distance shipping, complicated logistics and digital infrastructure to meet food needs. Industrialised countries regardless of location might learn from responses and innovations of US-based non-commodity LRFS to better: (i) diversify food production and distribution in terms of scale, geography and intent; (ii) collaborate across sectors to meet emerging food needs; and (iii) develop relationships that facilitate real-time feedback between on-the-ground food system stakeholders, regional organisations, universities and governmental decision-makers.

1.1 Motivation

Sectors that comprise U.S. LRFS provide varied and compelling responses to their partners and members in times of acute crisis. With shorter, more localised supply chains, they can be more sensitive to communities' local particularities. However, documenting and sharing geographically disparate, local innovations presents unique methodological challenges. We employed an iterative, mixed-methods approach rooted in community-based research to capture the market trends and farm/food business responses that rapidly emerged and evolved in this era as LRFS enterprises positioning themselves as local alternatives. This research project evolved through an iterative approach between the research team and food sector representatives, resulting in co-produced knowledge and guidance on place-based, real-time responses to crisis.

Given the dearth of standardised, timely, nationally representative LRFS data, this project provided a forum for actors in LRFS to discuss ongoing innovations. This paper first presents the theoretical framing from which the participatory, iterative and transdisciplinary methods of the project were built. We suggest that food systems are assemblages – locally unique, multidimensional and the complex result of stakeholders negotiating different strategies, relationships and ideas to create viable enterprises. Recognising these characteristics while facilitating stakeholder participation in research and analysis is an effective framework for navigating the emergent properties of these complex systems as they respond to a global pandemic. We then provide an overview and conceptual model of the origins, makeup and work plan of the LRFS Response to COVID-19 project and detail the diverse array of stakeholders as well as the mutually reinforcing project activities and outputs.

Understood within the holistic context of the project's complete portfolio of intended outcomes, the project's consumer survey offers an engaged, scholarly approach to the development, implementation and analysis focused

on LRFS during an emergent, evolving situation. This assertion is further supported by an overview of the broader interaction between survey analysis, stakeholder innovations and co-creation of research, outreach strategies and project outputs. The conclusion shares reflections and recommendations on how future research might integrate mixed-methods and interactive stakeholder engagement as an assemblage approach to complex and diverse economic systems.

1.2 Global food system disruptions during COVID-19

To fully comprehend the magnitude of the disruption faced by global food supply chains during the early months of the COVID-19 pandemic, a couple of key trends on food buying behaviour illustrate important shocks that were commonly highlighted among project partners. These trends occurred both in the United States (where this project is focused) and across other developed countries that rely on high-volume commodities and standardised supply chains to assure that food processing, retailing, food service and consumer activities run smoothly.

The most noticeable shock to many was the impact of 'stay-at-home' orders on the food-away-from-home spending that had come to represent over half of U.S. food buying dollars in recent years. While geography, politics and the progression of the pandemic shaped the extent of these orders, most states in the United States advised or mandated some degree of lockdown in March or April of 2020. Some states kept these orders in place for months, others for just a few weeks (Moreland et al., 2020). Figure 2 shows that pre-COVID-19 food spending was around U.S. $137.4 billion per month, but overall spending on food fell to U.S. $105 billion in April 2020. This trend was driven by a precipitous drop of U.S. $36 billion in spending at food-away-from-home establishments, such as restaurants, school cafeterias and other eating places (USDA ERS, 2020b). Food sales rose through late 2020 with a higher share continuing to be sold through grocery stores, supercentres and other food-at-home retailers while food away from home struggled to recover. However, higher at home food spending did not fully offset lower spending at food-away-from-home establishments until March 2021 when there was finally a full recovery in food away from home spending (returning to its pre-COVID levels). Moreover, there is noted inflationary pressure in the food sector, so some of the rebound in spending may be driven by higher prices for food purchased at home and away from home. Spending patterns continue to adjust through 2021, and with new concerns about a resurgence in hospitalisation rates and new public health advisories, it is not clear whether renormalised spending patterns will persist.

These trends were not unique to the United States, as a report from McKinsey and Company (2020) shared that, among 630 Australians surveyed in March 2020, many noted a preference to shift away from dine in (39 per cent less), take out (10 per cent less) and delivered restaurant food (3 per cent

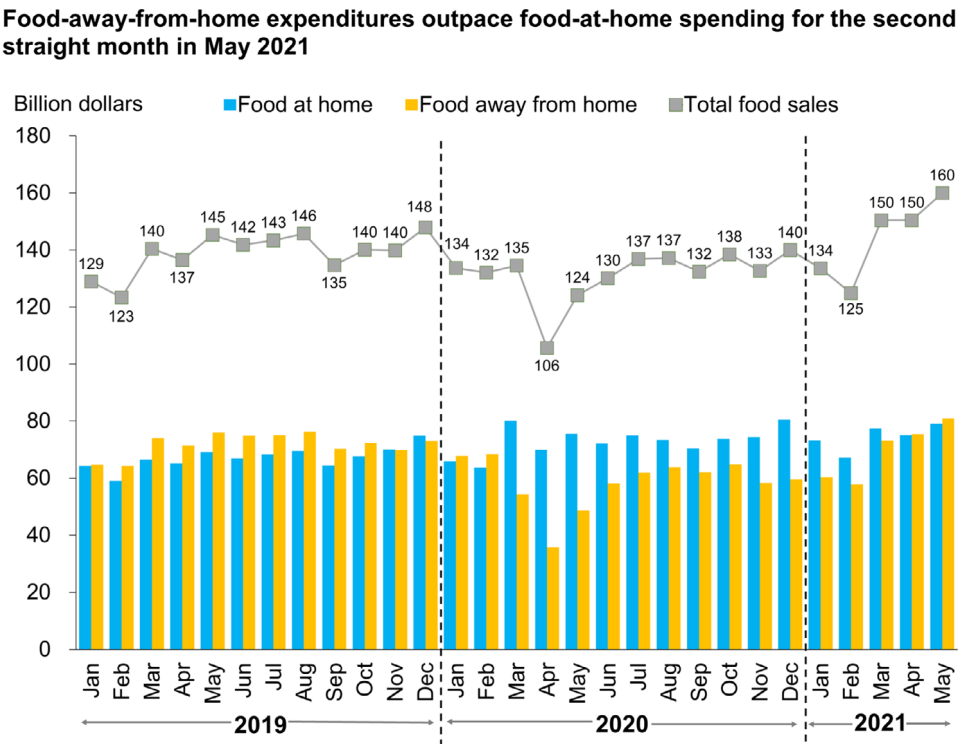

Figure 2 Food-away-from-home expenditures outpace food-at-home spending for the second straight month in May 2021. [Colour figure can be viewed at wileyonlinelibrary.com]

less), with 36 per cent shifting to groceries for their ready-to-eat meals and food products. Also, when asked if they expected their preferences to shift after COVID-19, around 10 per cent reported they will still be less likely to eat out, instead having more meals delivered or shifting to shopping at groceries to purchase ready-made foods.

These key trends – stimulated by COVID-19-related disruptions – had numerous consequences for supply chains in developed countries such as the United States, Europe and Australia, a bit unprepared. Developed food supply chains are structured to move products efficiently using packaging and distribution models that are well-suited for the intended buyer (i.e. retail consumer vs. institutional buyer). The rapid loss of institutional markets and the unprecedented shift to food at home in a short period left supply chains and retail food systems overwhelmed with logistical challenges. Some regulatory flexibilities and quick action by managers resolved many of the supply chain challenges within months (CAST, 2020; Thilmany et al., 2020). Additionally, food buyers explored a variety of new markets if and when they saw shortages in their normal food outlets. Local and regional food markets saw increased buyer interest and new customers as a result, somewhat

offsetting the lost institutional buyers but requiring new marketing strategies to effectively capture new opportunities.

Another trend that emerged during the initial COVID-19 response was the shift to online sales. Grocery and meal delivery allowed households to comply with stay-at-home and broader public health guidance. Figure 3 shows the estimated penetration of online grocery sales in 2018 across a range of developed countries, along with significantly higher predicted shares in 2023. Since more consumers saw online platforms for delivery or curbside service as a reasonably safe option for food acquisition, buyers, producers and markets have adopted or expanded online shopping and delivery options. The United States was mid-range among countries in terms of online penetration (Money Artist, 2020), but as is expected in many countries, COVID-19 events are now being viewed as a catalyst that is accelerating a long-term increase in the share of food procured through online platforms that will persist once markets have settled into a 'new normal'.

The shift to supermarkets, supercentres and online platforms is perhaps most noticeable, but such an acute shock is likely to have a 'ripple effect' within food systems, where certain subsectors could end up as 'winners' or 'losers' in terms of market share and new buying patterns. The project team, with guidance from the project's sector-based partners, prioritised conducting a national consumer survey as a critical activity that would allow the sector to better understand changes in consumer behaviour relative to local food markets, given the lack of timely and channel-specific data available. We discuss this endeavour in more detail in the methods section. We also employed listening sessions and monthly calls with representatives across LRFS sectors to document localised and varied experiences of various

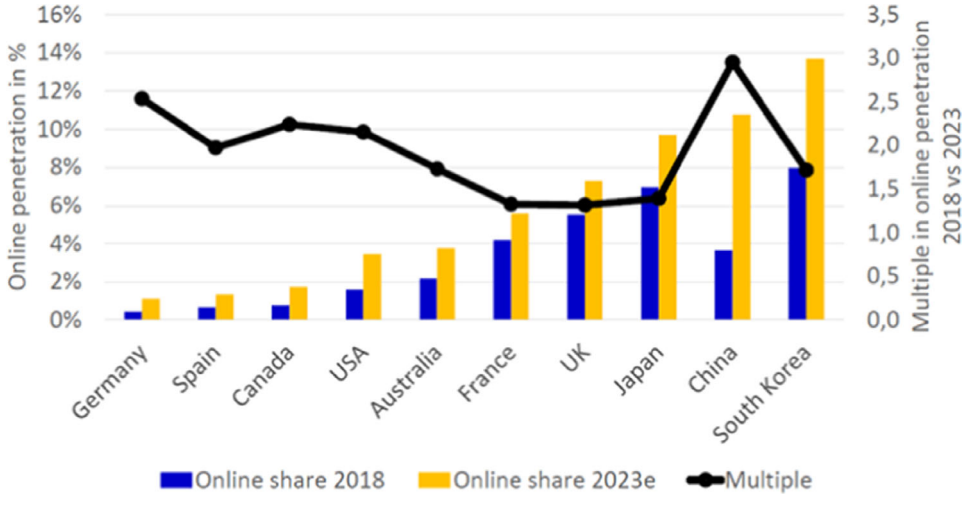

Figure 3 Online penetration in groceries in select markets, 2018 and 2023 (estimated). Source: Money Artist (2020). Figure based on Voya Global Fund (IGD) data. [Colour figure can be viewed at wileyonlinelibrary.com]

stakeholders in diverse food systems that would add necessary context to the information gleaned on consumer choices. By collective diverse data, we sought to better understanding how COVID-19 disrupted supply chain relationships that comprise food systems from different perspectives across time and with attention to unique marketing channels (while USDA data generally only differentiate broadly between food at home and food away from home).

2. Project overview

2.1 History and the coalescing of the project and team

Local and regional foods are key to the U.S. COVID-19 pandemic response. LRFS create new market opportunities for value-added and niche products, are able to adapt quickly to meet the needs of their local community and can strengthen and create diverse supply chains that open competition and more equitable markets for producers of all sizes and backgrounds, including Black, Hispanic, Indigenous and other farmers of colour. All of these elements are necessary to create a more resilient food system and stronger rural economies built to withstand a pandemic or other future disruption.

Understanding that the COVID-19 pandemic was unprecedented, that assistance to the LRFS would be needed but that the nature of the sector's need was unknown and that community-level engagement was essential to both understand the true need and distribute resources, USDA Agricultural Marketing Service (AMS) entered into a cooperative research agreement (funded by USDA AMS) with three university partners and 17 community of practice coordinating organisations (COPCOs). The research team was led by the University of Kentucky and included Colorado State University and the Northeast Regional Center for Rural Development at Penn State University. The three university partners established a transdisciplinary team whom through their unique expertise and skill sets where able to frame and guide a diverse set of project activities ranging from facilitating listening sessions to developing and analysing a national consumer survey to conducting social network analysis of the stakeholders involved. A shock of this magnitude to the LRFS with its nearly immeasurable impact required this type of transdisciplinary approach to be able to more fully capture the channel-specific implications of these impacts, plus frame effective, targeted resources and technical assistance to practitioners.

The LRFS is made up of various market channels and stakeholder groups all with their unique challenges and needs, but there are also many similarities and great potential for cross-sector collaboration and learnings. The seventeen chosen COPCOs gave representative voices to these market channels and stakeholder groups including farmers markets, restaurants, local fisheries, small meat processors, black, indigenous and people of colour working throughout the food system, farm to institution, food hubs, farm to

school, agritourism, community supported agriculture, independent or cooperative grocers, auctions, regional grains, community kitchens and state departments of agriculture (which often operationalise federal programs).

This project leveraged the national reach, relationships and funding of the Federal government, the quantitative and qualitative research expertise of the university partners and the stakeholder relationships and depth of practitioner knowledge of the COPCOs to create a unique approach to research and technical assistance in a time of unknown impact and need. Through this approach, this project team was able to listen, iterate, adapt and respond directly to the needs of farmers, fishers and food businesses in a way that lacks in many other research projects.

The overarching research questions guiding the project were defined after contemplating mega-trends affecting U.S. food supply chains and initial discussion with project partners. Guiding questions included:

1. How and in what ways are sectors of LRFS responding to COVID-19?
2. What marketing and broader management adaptations have been successfully implemented in response to COVID-19?
3. What obstacles and impediments have farm and food enterprises encountered in their response? How do policy regulations, support programs and technical assistance vary among and within sectors? How are supporting institutions (nonprofits, trade organisations, technical assistance partners) aligned with the LRFS sectors adapting to these obstacles?
4. What are the direct economic impacts of COVID-19 on the sector, and what other hidden or broadly defined value-chain impacts are being observed in local and regional food systems?

In outlining a plan of work, the research team recognised that the complex nature of a rapid-response project necessitated a novel-to-economics approach. Specifically, the economic and noneconomic forces at play could not be adequately understood through conventional economic assessments. Further, the adaptations and innovations implemented by the project's COPCOs and their stakeholders can be viewed as short-term triage that has longer-term impacts. As stakeholders scrambled to adapt and survive, their actions set in motion conditions for the reshaping of future possibilities. These practical, material and temporal complexities necessitated a nuanced research approach to: (i) understand how specific stakeholders were impacted, (ii) assess the potential consequences of certain responses and adaptations and (iii) identify underlying factors that relate to both vulnerability and resilience in food system sectors.

The COPCOs collaborated with the research team to share their perceptions, COVID-19-related resources and connection with sector-specific member networks. From these relationships, the project team developed a number of different outputs to quickly assess the sectors' changing viability

and performance during this market disruption. A compilation from the first year of that project, including a rich resource hub of materials developed by collaborating partners, is available for the public at the project's website: https://lfscovid.localfoodeconomics.com/

The following section provides a high-level overview of the project's applied research plan including theoretical grounding, key activities and varied outputs as well as highlighting the participatory and co-productive nature of those processes.

2.2 Theoretical framing

In a departure from traditional economic inquiry, the methods of this fast-paced, participatory project reflect the complex and diverse social relationships involved in ensuring the continued functioning of food systems through a time of crisis. Our project convened academics of different disciplines (agricultural economics, rural sociology and geography), researchers from a government agency and a diverse array of food systems practitioners. To harmonise the diverse experiences, perspectives and voices of this project, we employed a participatory and transdisciplinary approach to knowledge generation and analysis, understood for our purposes as a mode of Participatory Team Science (PTS).

Participatory team science – an emerging approach centred on project-based transdisciplinary knowledge creation – requires the cultivation of mindsets open to collaboration and interdisciplinary perspectives (Cross et al., 2021). PTS respects and values local knowledge, questions and priorities. As such, successful research teams establish trusting, genuine relationships (Cross et al., 2015), which facilitate open communication, collective problem-solving and team dynamics, management and leadership (Cross et al., 2021). Additionally, PTS (and food system research broadly) is enriched by participants with both content (scientific fields) and context expertise (understanding of place, community and issue). This is reflected in both the different stakeholder types engaged in our project, the diverse research and engagement methods, and the variety of project outputs.

While the academic theories underpinning the methodological and analytical approach to our project were not made explicit with non-academic stakeholders, creating a shared understanding among academic partners of novel theoretical and methodological approaches is vital for transdisciplinary teams. The following section provides insight into the theoretical frameworks drawn from Science and Technology Studies (STS) that inform the framing, implementation and analysis of this transdisciplinary project. The following section will provide a brief discussion of concepts of diverse economies and economic performativity as they related to understanding the full spectrum of impacts and outcomes of COVID-19 for LRFS.

To start from first principles, economics is a social science, not a natural science. Adjacent disciplines in the social sciences call attention to the varied

ways in which economies are constituted by the human communities that create them, and the diversity of types and matters of economy contained therein (Gibson-Graham, 2006). Economics 'articulates with, influences, is deployed in, and restructures concrete economies in all their messy materiality and their complex sociality' (MacKenzie et al., 2007, p. 2). Within the economies, market-based phenomena are co-produced with the economic, historic, cultural and environmental contexts within which they organise – none of which solely determines market behaviour and yet all of which contribute (Law, 2004, p. 42).

While acknowledging there is a thing – a social fact, a phenomenon – that is the economy, theories of economic performativity suggest economics is best understood as a collection of tools, methods and theories that play a significant role in the production and reproduction of the very markets, market actors, economic institutions and phenomena of concern (Callon, 1998). Thus, understanding economics as performative begins by recognising that the doing of *economics* impacts the workings of *economies*. This includes not only the institutions, norms and rules of existing economies, but also practical/bio-physical and philosophical/intellectual dynamics that push the frontiers of what is or is not legible or admissible to economic analysis (Callon, 2007). As emphasised by Brisset (2016, p. 161), the power and performativity of economics lies not only in its discourse, but in the ways in which theory and discourse are deployed in 'practical conditions'. Our project's methods and engagement processes were designed to prompt consideration of more-than-financial factors when investigating what kinds of impacts the COVID-19 pandemic has had on local and regional food systems. The recognition of contingent and mutually reinforcing socio-economic factors became particularly salient when trying to address the highly varied causes and consequences of a global pandemic. Considerations of community food security and the role of emergency food, material considerations of the role of geography, values-based consumer decision-making and other socio-technical factors shaped the analysis of project findings.

2.3 Methods and approach

As discussed in the previous section, our project involves collaboration across areas of expertise and collaborative knowledge creation. Consequently, we employed a mixed-methods approach to outline different facets of LFRS stakeholder response to COVID-19. As discussed in the previous section, participatory team science – which emphasises transdisciplinary knowledge creation with direct input from stakeholders – guided our iterative approach to developing data collection instruments and analysis. As such, data collection strategies – including the development of our consumer survey – were guided by a rich set of perspectives that exceeds the boundaries of traditional disciplinary conventions, such as surveys that are 'anchored' in questions and framing that draws mostly from previous literature. We

identify how this participatory approach specifically led to the creation of a consumer survey – a common approach in consumer economic inquiry.

2.4 Qualitative methods

While the results presented in this manuscript focus primarily on insights gathered from the consumer survey, survey development was one of many outcomes from our team science approach. Now we will briefly overview our broader contribution through this project: a unique engagement process whereby project partners and stakeholders co-created real-time assessment instruments and strategies during a time of crisis.

2.4.1 Impact assessments, listening sessions, webinars and innovation briefs
Working from social science methodologies grounded in a participatory ethos and historical roots in the land grant mission, the team's rural sociologists developed a listening session protocol designed for use with each of the 17 communities of practice engaged in the project. The listening session protocol was constructed to explore supply chain dynamics in a flexible format, and it used three primary questions as prompts to frame the discussion:

1. What impacts to the sub-sector occurred due to disruptions caused by the COVID-19 pandemic?
2. What adaptations were implemented by individual stakeholders, the sub-sector or the communities within which markets operate because of those disruptions?
3. What do stakeholders see as emerging issues or opportunities moving forward?

Finally, the protocol, and the guidance to COPCOs in selecting listening session participants, explored how disruptions may uniquely and/or disproportionately impact historically marginalised and underserved stakeholders within that sector.

A detailed summary was generated for each listening session, and those de-identified findings were shared with all research team and USDA partners. From there, qualitative researchers conducted a thematic analysis to identify issues and opportunities common across communities of practice, as well as those factors with unique import for specific subsectors. Thematic findings from listening sessions and impact assessments were used by the research team to refine the second stage of project activities, including the consumer survey (described below), a Webinar series and innovation briefs to learn more and share out innovations to address COVID-19 disruptions and new market dynamics.

Concurrent to the listening session, impact assessment and webinar activities, project partners developed mini-case studies titled innovation briefs that provide snapshots of creative approaches across LRFS of

stakeholders harnessing resources, energy and relationships to meet immediate needs within a community, capitalise on an emergent market opportunity, often combining both. Through collaborative research, writing and editing, the innovation briefs leverage the COPCO's keen insight into the dynamics of their LRFS subsector, the research and writing capacity of university partners, and USDA's broad perspective and ability to amplify success stories to those with the capacity to enact change in policy, funding and programming. Acknowledging and leveraging the strengths of project partners in a nonhierarchical manner worked to disrupt patterns of extractive research relationships by instilling a culture of transparency, mutual accountability and reciprocity.[1]

Finally, monthly meetings of all project participants (COPCOs, researchers, USDA staff and invited guests) were designed to support the project's overarching goals of fostering cross-sector collaboration, deepening understanding of the complex dynamics at play within LRFS and promoting multidirectional communication and mutual accountability among all project partners. This included facilitated large and small group discussions, regular reporting on project outputs from research partners, update presentations on sector activities from COPCOs and report-backs from USDA team members and invited guests on evolving programming and policy initiatives (including opportunities for the partners to provide timely feedback).

Most relevant to this paper, findings from the consumer survey were quantitatively analysed based on direct queries from COPCO participants and presented as 'data bites', or short presentations on discrete pieces of analysis with prompts for COPCOs to reflect on the potential significance to their sector. While the participatory methods of the project added complexity to a fast-moving initiative, the results of the process justified the effort. Engaging COPCO leaders in the research process allowed for a kind of real-time validation or ground-truthing of both specific market trends and broader insights into the dynamics of LRFS. As illustrated in the following quote, COPCO leaders were able to glean valuable insights into the unique needs of each sector:

> 'A good number of folks [in today's listening session) I have not met . . . but I thought it was really interesting how [they discussed the] disconnect between farmers' needs, and then who traditional TA providers are serving and how they're serving them. And that just feels right. That's feels squarely within our work as a network. . .. So, we have a lot to talk about later.' - COPCO leader during listening session debrief.

At the same time, researchers leveraged those insights to tailor research instruments and analysis so they were attuned to the needs for data or

[1] https://lfscovid.localfoodeconomics.com/briefs/

technical assistance in a rapidly changing market and social environment. To fully capture themes of these trans-sectoral discussions and address the complexity inherent in food purchasing decisions during the pandemic, a survey was developed based on common themes from the listening sessions, regular cross-sector meetings and highlights from the sector's innovation briefs. Ultimately, this allowed us to learn how issues and factors at the top of mind among supply chain leaders resonated with consumer perspectives and choices during the early months of COVID-19.

2.5 Quantitative methods

To better understand changes in consumer behaviour related to COVID-19 and social distancing measures, with a focus on the implications for LRFS, the research team conducted a national survey of 5,000 households in the fall of 2020. The survey provides important insights into how the pandemic changed the way that U.S. households made food choices, and whether some of the changes may be sustained post-pandemic by households. This Consumer Food Insights series, available on the project website, provided timely, easy-to-interpret information about what we learned about consumer's behaviour during the early months of COVID-19 to help guide LRFS businesses (available at: https://lfscovid.localfoodeconomics.com/consumer-food-insights/).

2.5.1 Consumer insights survey instrument development

To effectively leverage the rich context that this project's inclusion of LRFS stakeholders afforded, the framing, development, analysis and outreach of the consumer survey were conducted with an iterative approach that allowed for co-creation of the survey instrument and priorities in framing the analysis. Although the team also drew from existing instruments, such as the Bureau of Labor Statistics' Consumer Expenditure Survey and the FoodAPS National Household Food Acquisition, many of the questions in the survey were adapted to reflect key COVID-19 trends that were of particular interest to the COPCO market channels, such as increased use of local market channels and online shopping methods. The listening sessions were particularly rich contexts for development of the survey. Real-time questions and insights requested by stakeholders – that is the target audience for and collaborators in research – assured a higher level of impact to each LFRS sector.

Based on feedback from impact assessments and listening sessions, as well as direct, one-on-one feedback sessions with the research team, we developed a questionnaire that captured timely and relevant food buying patterns in a uniquely disaggregated set of thirteen market channels. Deviating from the traditional strategy of asking consumers about specific food products, we asked respondents to focus on the marketing channels where they shopped, how shopping patterns were changing, and what the underlying motives, drivers and factors were that influenced those buying patterns. This survey

also included questions to capture respondents' use of online shopping and delivery/pickup methods for each type of market channel.

Based on the trends identified earlier in the paper, alignment with other data collected by government sources (to benchmark our findings), and themes that emerged from the discussion with COPCOs, the survey goals were established:

1. Understand in what ways consumers of all types (those who highly value local food and those who do not) have shifted their expenditures, preferred market channels and time spent on food-related activities in the past 6 months since the onset of COVID-19 restrictions in the U.S.
2. Identify food behaviour changes across different groups of consumers, such as those who consider local 'very important' in their food purchasing decisions. This will help partners better understand their 'target' audiences and how they are behaving during COVID-19.
3. Assess consumer confidence and plans for the future to understand whether changes in consumer behaviour, observed during the initial period of COVID-19 in the United States in April 2020, will persist across the coming year.

The survey was conducted online from mid-October to mid-November of 2020 using Qualtrics XM software and a paid panel, with quotas set to assure a demographically balanced sample, with the exception of gender (as females are more likely to be primary shoppers for their households; U.S. Bureau of Labor Statistics, 2017). Since it was evident from stakeholder input and the rapidly changing market conditions that changes across time would be an important aspect of understanding consumer behaviour, the survey was structured to capture choices at three points in time but collected once during this fall 2020 survey. Since it is challenging to recruit a consistent set of respondent panellists across time for a longitudinal study, we chose to ask respondents to share their behaviour at three points in time, September 2019 (pre-COVID), April 2020 (initial COVID response) and September 2020 (directly before the survey) to allow for analysis of change catalysed by the pandemic. But, as a way to check for consistency, we asked some questions directly from the BLS Consumer Expenditure Survey to confirm whether responses from the survey aligned with data from that earliest time period when recall may have been particularly challenging (September 2019). The median and mean expenditures of our sample aligned with those reported by the BLS for September 2019, offering consistency.

Although there were concerns about respondents' ability to recall, we chose this survey framing taking a couple of items into consideration. First, we were asking about spending at markets (not for single products), and since many households have monthly budgets or bank/credit card statements where they are reminded of their expenditures with merchants, we believed they have a better sense of spending by types of food business.

A variety of questions were asked about demographics, how COVID-19 is affecting their household, and household food behaviour, including (i) purchases of food through a variety of market channels and sources, (ii) use of online platforms, (iii) motivations to choose various food channels and (iv) confidence and values aligned with various food issues and institutions. Once data were collected, we shared insights with stakeholders via 'data bites' at monthly cross-sector meetings to sharpen the interpretation of trends seen in the data.

Apart from the development process, this survey is unique among national food consumer surveys. For comparison, USDA data collection has historically been by commodity, not by market channel. Our survey includes questions related to 13 different market channels, many of which are direct-to-consumer oriented. National data on direct-to-consumer food sales have been collected since the 1978 U.S. Census of Agriculture, but specific data products that capture information on food post-production are still incomplete. The 2015 USDA National Agricultural Statistics Service Local Food Marketing Practices Survey was intended to fill this gap, providing data on the marketing of locally and regionally produced agricultural food products. However, responses to the inaugural survey are limited, and results from the 2020 survey are not yet available (USDA NASS, 2021). In short, the project survey provides some much-needed market information, framed by priorities of sector leaders, during a time of unprecedented crisis.

2.5.2 Profile of survey respondents

The gender breakdown of respondents is 62 per cent female, 38 per cent male and 0.42 per cent who responded other, self-identified or preferred not to answer; this is not surprising, since the survey asked for responses from the primary grocery shopper. Respondents' race, ethnicity, age and income were representative of the United States as a whole (allowing us to generalise from our results). The majority of our sample identified as white, and of the portion of that group who identified as Hispanic (18 per cent), the majority were of Mexican or Chicano origin. All other ethnicities responded at a rate consistent with U.S. demographics, and a small share identified with more than one race. For income, there was a representative distribution across income level. The sample is representative of those above $100,000 in annual income, but a lower share at the highest income levels (above $150,000 if we were to disaggregate at that level). However, we do not feel this presents any potential bias since food shopping behaviour is generally considered a primary good and most key differences would be at lower income levels.

Having school age children is another interesting demographic that may influence food buying habits, since virtual schooling may increase the need for more home food preparation, some schools offered meals for families to pick up, and the time available for shopping and preparation may be influenced by other household demands. Over 40 per cent of households had at least one child under 18 living with them, and over 20 per cent had at least

2 children. The average household size for survey respondents was just under three people (2.76), and only 10 per cent of our sample had households with over 4 members.

Changes in perceived health risks, essential status[2] (assuming many people with nonessential status began working remotely), hours worked, and income changes are all likely to influence how and where food is purchased and will be considered in future insights on food shopping choices. When we asked survey respondents about this, we found:

1. First, in terms of perceived health risks, the majority of households (76 per cent) had not yet been directly affected (diagnosed with COVID or with someone susceptible to COVID) at the time of the survey, but in one consumer data 'byte', we did consider how the 23 per cent whose situation was or remains vulnerable have changed their food shopping choices.
2. In terms of perceived economic risks, over one-third (37 per cent) of the sampled households were working in jobs declared essential during COVID as of October 2020 (25 per cent were nonessential and 28 per cent were not working), while 5 per cent were in areas with no restrictions. The economic disruptions to households seem to be the most prevalent, with 43 per cent of our sample losing their jobs, being furloughed or securing less income, and with only a small share (5 per cent) seeing hours/income increase.

3. Results: Placing survey findings in context

As a focus of this research collaboration was to explore more nuanced food supply chain dynamics, the consumer survey includes highly disaggregated market channel categories (that also represent the food supply chain partners informing the project's activities). As discussed above, respondents were asked several questions about three points in time: September 2019 (pre-COVID), April 2020 (when stay-at-home disruptions were new and widespread) and September 2020 (as the post-disruption patterns normalised). Again, it is important to note that these questions were asked in the same survey taken in late 2020 and so they are perceptual recall data about expenditures.

To highlight the interactive nature of the applied consumer discovery process, we present survey results together with some examples of how results were shared, reflected upon and refined based on interpretations reached through the team's collaborative discussions, received by Webinar audiences, and aligned with and complementary to the Innovation Briefs being developed by our supply chain partners.

[2] 46 states and Washington, DC, issued some sort of guidance on which sectors and industries they consider 'essential' despite pandemic-related restrictions.

3.1 Market channel participation

Survey respondents were asked about their participation in 13 market channels, which were designed to capture traditional, larger format markets (e.g. supermarkets and supercentres), as well as local and regional market channels (e.g. farmers markets and other direct-from-producer channels) and other nontraditional channels (e.g. food boxes and meal kits).

Overall, larger format food retailers (e.g. supermarkets and supercentres) continue to be the most common choice for food purchases by consumers in this sample. Still, we found a significant portion of consumers (35 per cent) using new market channels during COVID-19 (Figure 4) even though the remaining 65 per cent reported unchanged shopping channel behaviour. Over a third of the sample (35 per cent) reported that they had purchased food from at least one new channel since April 2020, and 17 per cent shopped at more than one new channel. These new channels included farmers markets, CSAs and direct-from-producer, artisan markets, local, independent restaurants and food boxes.

In September 2020, respondents' average food budget share spent at traditional, large format market channels (supermarkets and supercentres) was 55 per cent. However, rates of shopping at smaller format market channels increased across time. Small format, independent, and artisan markets and dollar stores all appear to have become more popular in September 2020 compared to September 2019 and April 2020, perhaps due to perceptions that smaller stores were easier to navigate and maintain social distancing (Box 1).

3.2 The importance of place and community size

A discussion of local foods is inherently place-based and so it seems clear that consideration of the spatial aspects of food markets is key to understanding shifts in consumer behaviour. As such, we considered whether average weekly expenditures by consumers at different market channels differed by community size. To do this, we segmented responses using the Rural Urban Continuum Codes[3] in the following way:

- Large communities: metropolitan counties with populations equal to or above one million
- Medium communities: metropolitan counties with populations below one million
- Small communities: all non-metropolitan counties.

[3] The 2013 Rural-Urban Continuum Codes form a classification scheme that distinguishes metropolitan counties by the population size of their metro areas and nonmetropolitan counties by degree of urbanization and adjacency to a metro area. These are the official U.S. Office of Management and Budget metro and nonmetro categories, which include three metro and six nonmetro categories (USDA ERS 2020a).

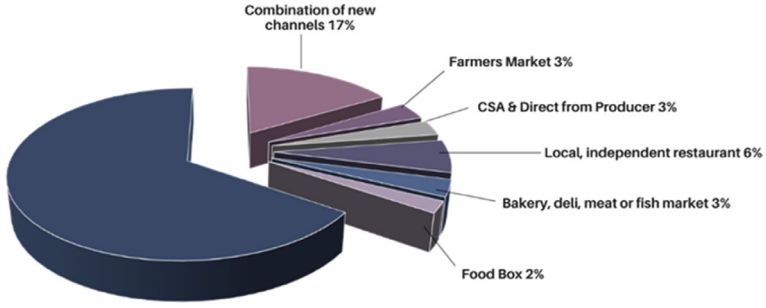

Figure 4 Did you buy food from a new farm or food enterprise? 1684 of 5000 (35 per cent) tried at least one new outlet. [Colour figure can be viewed at wileyonlinelibrary.com]

Box 1

Market innovations

To bring some of these dynamics to life, the Farmers Market Coalition developed an innovation brief that highlighted how markets conformed to social distancing guidelines and other public safety requirements to remain open and offer another food buying option to those who experienced short supplies at supercenters (or perhaps were shifting away from larger channels). Some changed to contactless drive-thru or curbside models, others opted for crowd control measures or limited entry designs, and some markets changed their model altogether from a traditional farmers market to a local food aggregator. (https://lfscovid.localfoodeconomics.com/briefs/alternative-farmers-market-models/).

As discussed above, we explored three points in time, focusing on mean market channel expenditures of respondents for different market channels compared to retail grocery chains, since this channel represents the highest proportion of overall expenditures for most consumers.

Figure 5 shows that while respondents in all communities increased their expenditures from pre-pandemic levels at chain grocery stores and supercentres by approximately 5 per cent per week, respondents in medium-sized communities also reported per week expenditure increases (8 per cent) at smaller format grocery stores, including independent and locally owned shops. One difference to note is that expenditures at specialty markets, such as butcher shops, fish markets and bakeries, decreased by 10 per cent in small- and medium-sized communities while increasing by 17 per cent in large metropolitan regions. As suggested by several of our sector leaders, place does matter.

Further, while consumers in all community sizes increased weekly expenditures (compared to pre-pandemic levels) at farmers markets, the largest increases came from respondents in medium-sized communities (18 per cent). However, when we consider direct-from-farmer purchases, which exclude farmers markets but include CSA, on-farm purchases and online

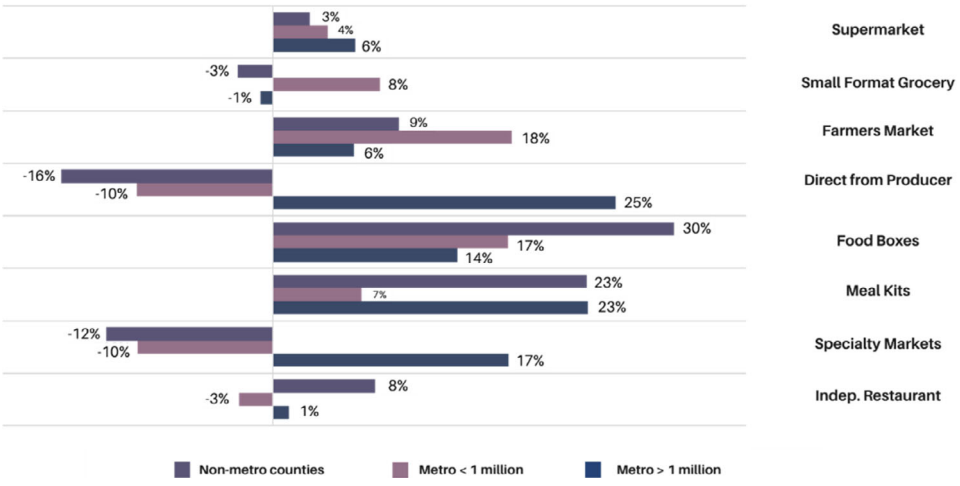

Figure 5 Overall change in weekly spending by community size and local food market channel. [Colour figure can be viewed at wileyonlinelibrary.com]

orders from farms, only consumers from large metropolitan counties show an increase in expenditures (25 per cent), while those living in small and medium-sized communities decreased expenditures by at least 10 per cent.

Meal kit purchases increased by 7 per cent in medium-sized communities and by 23 per cent in both small and large communities, and food box purchases (excluding CSA) increased by 15 per cent for respondents in large and medium communities and 30 per cent for those in smaller communities. These purchases may indicate a shift towards at-home consumption, especially considering expenditures at restaurants only increased modestly for small and large communities and slightly decreased for medium communities. It may also be that time constraints associated with increases in childcare duties such as homeschooling while working remotely could make convenience food more attractive. Along these lines, increased per-week expenditures from restaurants may also reflect the increased costs of delivery and take-out formats, a topic worth further exploration (Box 2).

3.3 Online shopping

One major trend in consumer behaviour during 2020 was the increased use of online methods to purchase food, including delivery and curbside pickup. Respondents in the survey showed an overall increase in their use of online purchasing methods. In September 2020, 51 per cent of respondents reported shopping online, either for delivery or curbside pickup, in one or more market channels where they shopped. This is an increase of 14 percentage points compared to pre-COVID behaviour in September 2019 (37 per cent of respondents reported shopping online to purchase food). However, this

Box 2

Responding to communities

The Innovation brief from the COPCO representing food hubs (local food aggregation and distribution businesses) gives an example of leveraging existing social and business networks to decentralize food box distribution to serve communities of all sizes. Fresh Approach, a nonprofit organization located in California that operates multiple food security and nutrition education programs, acted in a coordination role and provided funding, food, and other supplies to multiple small organizations embedded in the community. These smaller organizations acted as community hubs that were able to customize their approaches and product offerings and target customers based on their understanding of the true needs of their communities. (https://lfscovid.localfoodeconomics.com/wp-content/uploads/2021/02/Wallace-1.pdf).

'adoption' of online buying habits was not even across households when considering age cohorts.

Figure 6 illustrates some interesting dynamics across time and age groups. Pre-COVID, respondents in older age groups tended to have lower rates of online shopping compared to younger groups, and although older demographics still trail younger groups in overall use, the relative higher increase in online shopping by those 65 and older is an important signal that some 'at risk' households felt more urgency to try new models of food shopping.

The shift to online channels was also not uniform across different market channels. Figure 7 shows increased online shopping in all markets, but some local and regional markets had larger challenges in developing online programs compared to supermarkets, meal kits and food boxes (which were

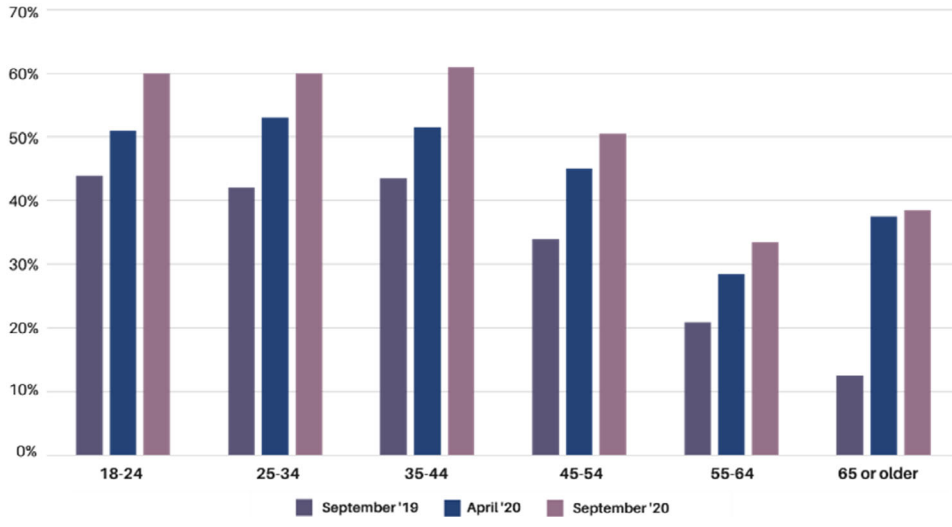

Figure 6 Changes in the share of households using online shopping options for all food markets, by respondent age group. [Colour figure can be viewed at wileyonlinelibrary.com]

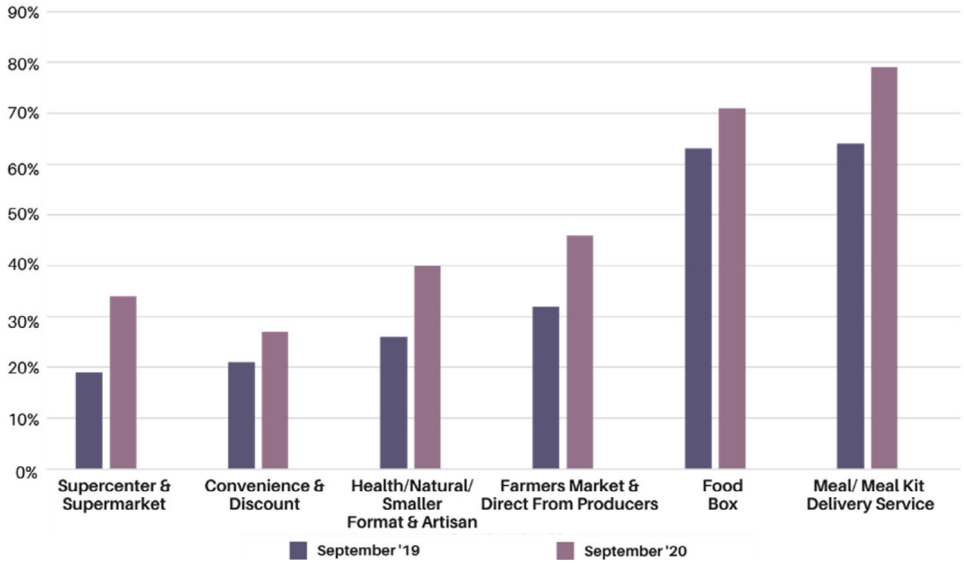

Figure 7 Changes in the share of households using online shopping options, by market channel. [Colour figure can be viewed at wileyonlinelibrary.com]

business models developed in the online space), and restaurants, which may have already had websites and delivery protocols in place (Box 3).

3.4 Consumer food values

The early project discussions about the dynamics underlying consumer shifts to local and regional food channels signalled to the team that it would be interesting to explore the relationship between consumers' values and perceptions and their food shopping behaviour. Accordingly, the survey included a series of Likert-scale questions on different aspects of food

Box 3

A shift online

A significant online migration was the focus of the March installment of the project's Webinar series: Online Platforms: Pivots and Planning for the Future. Among the key discussion points in this webinar were (i) the significant challenges to local and independent restaurants that struggled to maintain quality and fair terms of trade with delivery platforms in an era with escalated delivery traffic; (ii) resources available for producers who wanted a custom website or app to host on-farm or virtual events; and (iii) rapid response technical assistance needs and solutions for the farm and rancher sector (addressed effectively by the Community Supported Agriculture Innovation Network) (more information posted on the project's Resource Hub: https://lfscovid.localfoodeconomics.com/resources/csa-ideas-lab-farmer-to-farmer-ecommerceexchange/). (https://lfscovid.localfoodeconomics.com/webinar-series/).

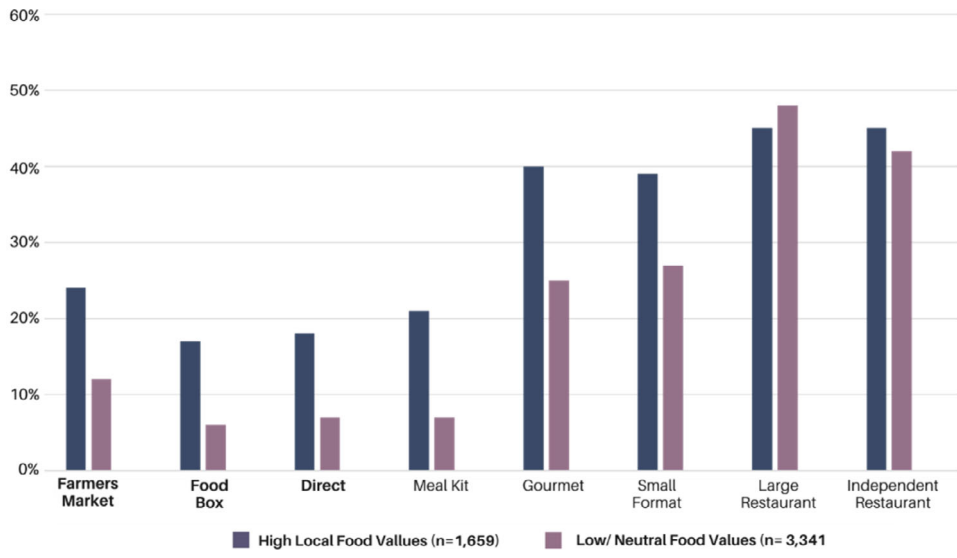

Figure 8 Market channel use and valuing of 'locally grown' foods, September 2020. [Colour figure can be viewed at wileyonlinelibrary.com]

behaviour. As seen in Figure 8, we observe that those who responded that 'locally grown' is 'very important' or 'important' to their food purchasing decisions (35 per cent) tended to shop in local and specialty channels at a higher rate.

However, this 'local bump' seen in market channels like farmers markets, small format grocery stores and artisan markets does not extend to local, independent restaurants, where these two groups of consumers (i.e. those who feel locally grown is important versus those who do not) participate at very similar rates. This is a relevant finding that echoes the struggles shared by the independent restaurant partner on this project, James Beard Foundation, whose restaurant members have been uniquely challenged by the COVID-19 pandemic through restaurant closures and the shift to online ordering and delivery platforms. This finding also speaks to the importance of disaggregating restaurant channels in survey protocols – large-chain restaurants versus local, independent restaurants – as opposed to a general 'food-away-from-home' category. This additional disaggregation allowed for insight into how these two different restaurant market channels are being used and perceived by consumers.

Table 1 shows how food values and beliefs may influence shopping patterns in more detail, with estimated monthly food budget shares and levels for all respondents, and then comparatively, for those who rated the importance of locally grown, local food products being available and whose purchases support the food business at a relatively higher rate than the general sample. For those worried about these values, food dollars shifted

Table 1 Share of food expenditures by market channel, by food value subgroups

Respondents with strong food values and beliefs[†] (Expenditure share, Monthly $ spent)	Large format grocery	Niche, independent & specialty stores	Limited selection	Direct & farmers markets	Boxes & meal kits	Restaurants
Total sample (n = 4694)	55.17% $331	12.49% $75	11.73% $70	3.14% $19	3.13% $19	14.33% $86
Is locally grown[‡] (n = 1563)	46.29% $278	17.11% $103	12.61% $76	4.94% $30	5.25% $32	13.79% $83
I believe local food products are easily (n = 1654)	47.51% $285	16.57% $99	12.21% $73	4.99% $30	4.74% $28	13.86% $83
My purchase supports the food business that I am buying from[‡] (n = 1979)	49.47% $297	15.38% $92	12.01% $72	4.28% $26	4.74% $27	14.43% $87

[†]6 or 7 on 7 point scale, where 7 is strongly agree.
[‡]Question asked: "suppose you are shopping for food and are deciding what to buy, how important is it that…".

from large format groceries (the dominant channel) to more niche, independent, direct and specialty markets (Box 4).

As seen in Figure 9, 51 per cent of those who felt strongly about reducing the spread of COVID-19 (by responding that they 'agreed' or 'strongly agreed') shopped online in September 2020, compared to 43 per cent of rest of the sample. These findings suggest that some level of the increase in online shopping behaviour may be related to reducing the spread of COVID-19.

However, given the fact that 43 per cent of the sample that was less concerned about reducing the spread of COVID-19 shopped online, the online shopping trend is likely to persist. Curiosity among the COPCO stakeholders about the persistence of online sales was a universal theme established early in the project. Subsequently, parsing out the share of respondents who shopped online for public health reasons compared to the share who shopped online for convenience or more options will provide

Box 4

Recognizing market opportunities

In an Innovation brief from the Local Catch Network on Oyster Trails, it was clear that fishermen and shellfish growers around the country pivoted to local and direct-to-consumer sales through new U-Pick oyster enterprises to leverage interest in direct-to-consumer sales, capturing visitors seeking a perceived "safe" form of agritourism and a way to support the local seafood industry (https://lfscovid.localfoodeconomics.com/briefs/oyster-trails/).

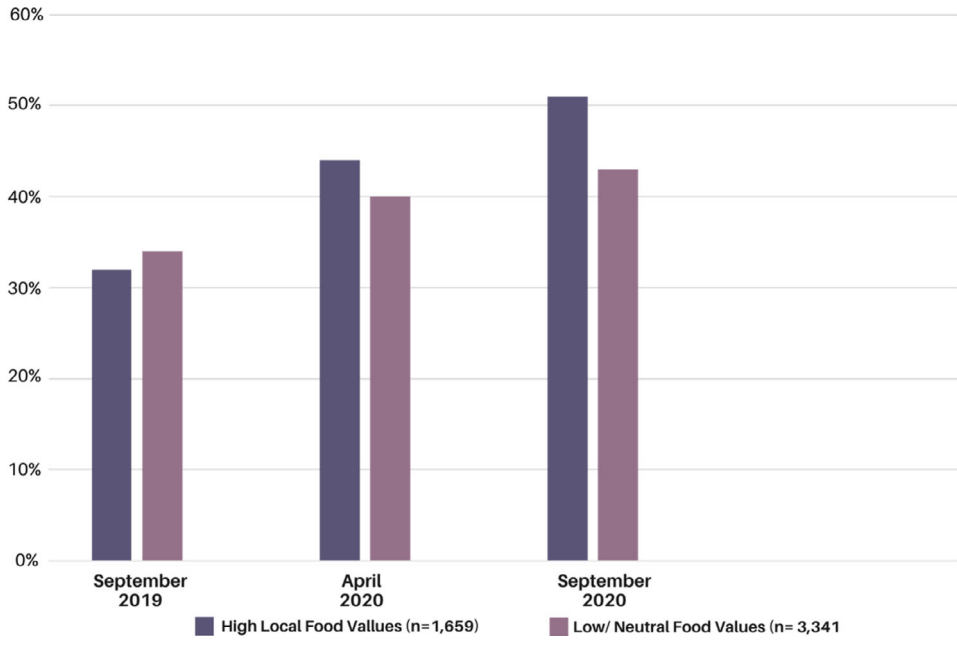

Figure 9 Frequency of online shopping by stated importance of reducing the spread of COVID-19, September 2020. [Colour figure can be viewed at wileyonlinelibrary.com]

valuable insights into the potential persistence of online shopping beyond COVID-19.

3.5 Food security and time spent on food activities

Even as early as April 2020, the COVID-19 pandemic had caused substantial changes for many U.S. households; 22 per cent of households in our sample reported losing their job, 7 per cent reported being furloughed, and 14 per cent reported having reduced income. Those who did not experience change in their employment status, and particularly the 25 per cent of our sample considered 'employees of nonessential status', experienced other changes, including working from home.

Working from home offers potential benefits to households. Increased food-away-from-home purchases have been found to result in reduced diet quality, and individuals working from home tend to spend more time preparing food for at-home consumption (Restrepo & Zeballos, 2020). However, the opportunity cost of time spent to prepare meals at home may be higher for low-income households (Davis & You, 2010). Additionally, low-income households may face additional time burdens associated with procuring food for at-home consumption from food assistance programs (including free and reduced lunches for children), particularly during

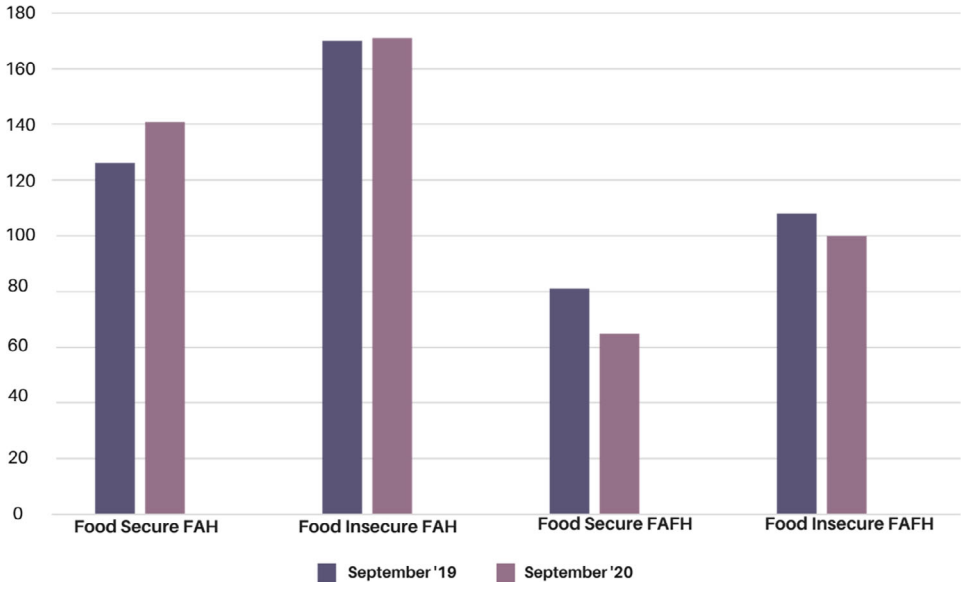

Figure 10 Average time households spent procuring and preparing food, by food-at-home (FAH) and food-away-from-home (FAFH) purchases and acquisitions, September 2019-September 2020. [Colour figure can be viewed at wileyonlinelibrary.com]

COVID-19 in the face of school and other closures (Jablonski, Casnovsky, et al., 2021) (Figure 10).

In our survey, households were identified as food insecure if, at any time from September 2019 to September 2020, they reported experiencing that 'their food did not last and they could not afford more'. By this metric, 46 per cent of the sample was classified as food insecure. While findings portrayed significant changes in the amount of time food secure households spent procuring and preparing food for at-home consumption, there was no evidence of significant changes by food insecure households.

However, there were changes in the utilisation of food assistance programs when we subdivided our sample by those who spent at least 10 per cent more time procuring and preparing food for food at-home consumption (as an ad hoc way to consider a marginal effect).

1. Food assistance that aligns with normal shopping behaviour may address any concerns about time constraints. In our sample, utilisation rates of the USDA's Supplemental Nutrition Assistance Program (SNAP)[4] program benefits were much higher among food insecure households whose time spent procuring and preparing food did not increase (60 per cent compared to 40 per cent).

[4] SNAP provides nutrition benefits to supplement the food budgets of needy families, so they can purchase healthy food and move towards self-sufficiency (USDA FNS n.d.b).

2. By contrast, utilisation rates of the USDA's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)[5] program benefits were higher among households whose time spent on procuring and preparing food at home increased during the pandemic (56 per cent compared to 41 per cent), perhaps a signal that using such programs increases time spent obtaining and preparing food for the household.

Although we cannot provide definitive evidence for these differences, they may be due to a variety of factors. First, the ability to use SNAP benefits for home delivery was fast-tracked. While the funding from the upcoming COVID-19 relief plan and other grants seek to modernise WIC, it currently requires multiple in-person appointments to participate and does not yet support online purchasing. Second, more food retailers accept SNAP than WIC, implying that the comparative restrictiveness of WIC increases the time burden associated with its use. Third, the WIC program targets households with children, which may include families with women who left the labour force to care for their children.

4. Building better beyond: a look to the future

During this moment of simultaneous disruption and rapid innovation, our project gathered leaders from 17 different sectors, ranging from such familiar faces on the frontlines of LRFS such as farmers markets and farm-to-school, but also, lesser known or emerging sectors like non-commodity grains and cooperative grocers, and key governance partners, such as the National Association of State Departments of Agriculture and the Indigenous Food and Agriculture Initiative. Although the consumer survey was one interesting applied research outcome from the project, it was made more contextually interesting by complementary efforts that strengthened networks likely to have continuing impacts for years to come.

As we conclude the year-long cooperative agreement, the findings from our efforts show that LRFS have proven their ability to pivot and adapt in times of crisis through diverse value chains and rich collaborative networks. Employing an adaptive and collaborative research process, our team has launched a virtual resource hub, conducted focus groups, convened monthly cross-sector meetings, published case studies and individual sector snapshots, hosted monthly webinars for the general local food public, fostered new cross-sector collaborations and centred issues of equity and access for stakeholders across LRFS, all with the aim of supporting long-term

[5] WIC provides federal grants to states for supplemental foods, healthcare referrals and nutrition education for low-income pregnant, breastfeeding and non-breastfeeding postpartum women, and to infants and children up to age five who are found to be at nutritional risk (USDA FNS n.d.a).

prosperity and resilience for LRFS and the producers and communities that rely on the economic and sociocultural opportunities they provide.

It is interesting to note that pandemic-driven shifts allowed U.S. farmers to see an increase in the share of food dollars they capture after 7 years of decline, given that farmers tend to receive a smaller share from food dollars spent while eating outside the home (USDA ERS, 2021). Thus, this project represents a timely initiative that allowed a maturing community of practice to reflect on how to position the LRFS strongly as recovery continues.

In the eyes of the USDA AMS, which coalesced this project team, a switch to real-time analysis and support has proven to be a valuable strategy, especially when there is such a significant disruption that requires an immediate response from all parts of the food system. The knowledge gained through this experience, both from the research project's deliverables and the disruptions and responses to COVID-19 as a whole, has caused the USDA to move towards viewing food and agriculture as part of a broader system and LRFS as a vital component of supply chain resiliency.

Going forward, continuing to understand the full impact of COVID-19 on the LRFS sector will require a continuation and expansion of this approach, including providing opportunities to LRFS practitioners to be heard, tell their stories, make recommendations and have an active support network. Centring and uplifting the voices of LRFS leaders gives inspiration, meaning and purpose to the hard work of making changes towards sustainability and more resilient food systems. As of fall 2021, there are plans to continue gathering the network, albeit with new insights on how to leverage the COPCO's expertise and perspectives from the first phase as well as more coordinated programming goals, as a means to guide policy and programming efforts that continue to emerge, allowing this community of practice to have an elevated 'seat and voice at the table'.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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