Building A Data-Driven Approach to Tackling Food Insecurity in the COVID-19 Pandemic

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Acknowledgements

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Introduction

Background and The Challenge

During a usual emergency, Santa Clara County is the Operating Area lead for food and necessities distribution for all cities and unincorporated areas of the County. However, in mid-March 2020 as the extent of the public health task became clear, the County asked the City of San José to accept countywide responsibility for the coordination and distribution of food and necessities so that the County could focus on slowing the spread of the pandemic. Starting March 17, 2020, the City of San José's Emergency Operations Center (EOC) and its regional food network partners worked to ensure the neediest residents of the County had access to food.

To meet the increased need for food assistance, San José focused first and foremost on maximizing existing networks and funding sources. We are grateful for the leadership of Second Harvest of Silicon Valley, the County's Office of Education, local school districts and other non-profits in feeding our most vulnerable. Where existing networks simply could not meet the increased need for food assistance, San José entered into new partnerships, created new programs, and expended the City's own funds to do so, with 90% of new funding going to non-profits and community-based organizations.

In all, this effort involved 8 different distribution channels and more than 500 different organizations, and there was no previously existing data infrastructure or process to track levels of overall food distribution, or distribution to specific sites and individuals. As a result, in March 2020, no system existed to understand how food insecurity was changing across the County and whether the efforts of the City and its partners were sufficient to meet the need.

Approach

The Food and Necessities Branch of the EOC formed a Data Unit. The Vision of the Unit was to be a **one-stop shop** for data and data requests, with the following objectives:

1. Empower operational units with data-driven insight on current and projected supply and demand.
2. Structure data and reporting to facilitate cost recovery from other jurisdictions as well as federal and state emergency management agencies.
3. Ensure that the Food and Necessities Branch can effectively report to and engage with key stakeholders, including City and County leadership and organizational partners.

The Data Unit accomplished these goals through an approach that achieved the following outcomes:

- Created unified data governance through technology and processes that standardized all data from 8 different distribution channels and 500 different organizations (see Figure 1). All data was collected from different sources and data formats from individual organizations, transformed via Python scripts, standardized for analysis, and loaded into a Microsoft SQL Server database.
- Creation and distribution of a weekly dashboard that provided visibility into trends in food insecurity and distribution by individual channels, and which was distributed to Branch, EOC, and City leadership and partners on a weekly basis (see Figure 2 and Figure 3).
- Creation of a web-based dashboard that provided the ability for the Food and Necessities Branch, as well as partners, to access detailed data down to the City, site, and individual level.
- Analysis of data to support cost recovery and reimbursement efforts, including calculation of cost recovery at the individual site and meal level for food service provided to 14 other local jurisdictions within Santa Clara County.

Insights Based on Data

The work of the Data Unit allowed all parts of the food and necessities distribution efforts to understand how the COVID-19 pandemic was affecting food insecurity in Santa Clara County. Key insights were:
- Food distribution increased 50% compared to pre-pandemic levels
- Food distribution increased to levels higher than seen during the Great Recession of 2009-2010.
- Demand was particularly high among at-risk communities including: seniors, low-income, medically vulnerable, and homeless populations.

Outcome

The City of San José and regional food network partners have now distributed over 100 million meals during the COVID-19 pandemic due to the hard work of so many within those organizations. The Data Unit contributed to this effort by building the first ever unified view of countywide food distribution through a combination of technology and process that integrated, standardized, analyzed, and delivered key data deliverables. These deliverables helped to ensure that all parties had visibility into trends of food insecurity. Using this data, the City and its partners stood up new programs and directed and secured new funding to meet that increased need. The ultimate outcome of this work is that the City and its partners met the moment and ensured that despite significantly increased levels of economic and food insecurity, there were no significant gaps or populations left unserved or hungry.

Background on Data

At the outset of the response, no unified data reporting existed across all channels and organizations providing food to the communities of Santa Clara County. Data collected on food provided, at which sites, and to which communities was collected individually by organizations doing the work. These organizations are focused first and foremost on delivering for the communities they serve, and their systems for data collection and reporting are optimized to enable that mission, rather than being optimized for data analysis. As such, data lived in different sources and formats, including:

- Google Spreadsheet
- Microsoft Excel Spreadsheet
- External Databases
- External Websites
- Email Correspondence

An additional challenge was that in addition to the dispersal of data in different sources and formats, the format of most data was not normalized to enable scalable data analysis and ensure data integrity. Examples of data can be seen below in Figures 1-3:

School District	School Site	Breakfasts (2020-11-01)	Lunches	Dinners	Total District Stat	Total Not District	Breakfasts (2020-11-02)	Lu
	Total # of Meals Served/Day	11835	14666	7161	93	2	15106	
ACE Charter Schools	ACE Empower							
ACE Charter Schools	ACE Inspire							
ACE Charter Schools	ACE Esperanza							
Alpha Public Schools	Alpha Jose Hernandez	0	0	0	0	0	30	
Alpha Public Schools	Alpha Blanca Alvarado	0	0	0	0	0	24	
Alpha Public Schools	Alpha Cindy Avitia HS							
Alum Rock Union SD	Adelante II Elementary	263	263				272	
Alum Rock Union SD	Cassell Elementary	109	109				119	
Alum Rock Union SD	Fischer Middle	184	184				275	
Alum Rock Union SD	George Middle	128	128				135	
Alum Rock Union SD	Hubbard Media Arts	215	215				197	
Alum Rock Union SD	Linda Vista	308	308				292	
Alum Rock Union SD	Lyndale	99	99				79	
Alum Rock Union SD	Mathson Institute of Tech	332	332				261	
Alum Rock Union SD	Ocala STEAM	700	700				484	
Alum Rock Union SD	Ryan STEAM	176	176				175	
Alum Rock Union SD	San Antonio/LUCHA	120	120				109	
Alum Rock Union SD	Sheppard/Painter	695	695				462	
Berryessa Union Elementar	Brooktree						74	
Berryessa Union Elementar	Cherrywood						56	
Berryessa Union Elementar	Laneview						85	
Berryessa Union Elementar	Majestic						145	
Berryessa Union Elementar	Noble						52	
Berryessa Union Elementar	Northwood						73	
Berryessa Union Elementar	Ruskin						102	

Figure 1. Example of Data Collected for Meals Delivered at School Sites.

| THT/MOW | TSJ | SHELF STABLE | | | Friday, December 4, 2020 | | | Saturday, December 5, 2020 | | | Sunday, December 6, 2020 | | | |
Meal Provider	Capacity /Room	Site CBO	Site Name		# Occupant	# Meals	Order Date	# Occupant	# Meals	Order Date	# Occupant	# Meals	Weekend Meal Count	Order Date
TSJ		Gilroy Compassion Cer	Days Inn		65	585		0	0		0	0	585	
TSJ			The Plaza		0	0		0	0		0	0	0	
TSJ			Casa De Novo Hotel		0	0		0	0		0	0	0	
TSJ		LIfe Moves	Motel 6 - San Jose		0	0		0	0		0	0	0	
TSJ			Best Western Plus - PMI		45	168		45	165		45	165	498	
TSJ		HomeFirst	Bridge Housing		0	0		0	0		0	0	0	
TSJ		LIfe Moves	E-Real Hotel		0	0		0	0		0	0	0	
TSJ		LIfe Moves	Holiday Inn Express		10	28		10	28		10	28	84	
TSJ		Abode	EZ-8 Motels, Inc.		80	200		80	200		80	200	600	
TSJ		St. Josephs Gilroy	Hampton Inn Morgan Hill		0	0		0	0		0	0	0	
TSJ		Abode	Hampton Inn Suites		0	0		0	0		0	0	0	
TSJ		Abode	Best Western		0	0		0	0		0	0	0	
TSJ	49		Americas Best Value Inn		80	720		0	0		0	0	720	
TSJ			Vagabond Inn-Sunnyvale		0	0		0	0		0	0	0	
TSJ			Motel 6 - Campbell		0	0		0	0		0	0	0	
TSJ	75	HomeFirst	Parkside Hall		0	0		0	0			0	0	
TSJ	61	Life Moves	Gateway Pavillion		60	180		60	180		60	180	540	
TSJ		LIfe Moves	Quality Inn		0	0		0	0		0	0	0	
TSJ	100	HomeFirst	South Hall		270	810		270	810		270	810	2,430	
TSJ	30	HomeFirst	Bascom Community Center		0	0		0	0			0	0	
TSJ	30	HomeFirst	Camden Community Center (		0	0		0	0		0	0	0	
TSJ	90	Abode	Trailers @ Kelly Park		0	0		0	0		0	0	0	

Figure 2. Example of Data Collection for Meals Delivered to Targeted Homeless Placements.

	Daily Average	1	2	3	4	5	6	7
CSJ Sites								
ALMA	40	38	38	33	41			44
ALMADEN	196	170	190	187	194			189
ALVISO	12		12					12
BERRYESSA	273	261	270	262	267			278
CAMDEN	92	89	86	87	88			93
CYPRESS	105	103	104	110	97			96
EVERGREEN	204	187	209	200	214			211
GARDNER	42	46	44	45	41			45
MAYFAIR	71	64	74	70	74			69
NORTHSIDE	110	112	112	115			108	103
ROOSEVELT	107	100	110	96	110	100		105
SEVEN TREES	78	84	81	80	80			78
SOUTHSIDE	115	100	122	104	147			100
WILLOW GLEN	88	83	82	88	90			88
TOTAL CSJ Sites	1,533	1437	1534	1477	1443	100	108	1511
NON-CITY SITES in San Jose								
AACI	83	129	51	39	46			
BILLY DE FRANK CENTER (closed)								
EASTSIDE NEIGHBORHOOD CENTER	181	165	165	168	166			166
JOHN XXIII	179	168	171	170	176			172
KOREAN AMERICAN COMMUNITY SERVICES	64	74	71	64	70			
POSSO	162	170	164	172	150			160
SALVATION ARMY SENIOR ACTIVITY CENTER	122	116	159	114	101			96
VIET TU TE	186				160	160	160	
VISTA CENTER	#DIV/0!							
YU-AI-KAI SENIOR CENTER	90	85	94	101	86			78
TOTAL SAN JOSE SITES		2344	2409	2305	2398	260	268	2183

Figure 3. Example of Data Collection for Meals Delivered at Senior Nutrition Program Sites.

Given the disparate, inconsistent, and denormalized source data, analysis of individual channels of food distribution was difficult, and integrated analysis of all channels was manual and time-consuming.

However, building a standardized data reporting structure would have been difficult on both technical and operational levels. At a technical level, building a system for many different organizations to report in a standardized fashion would have taken time and resources, both of which were not available given the urgency of a pandemic response. On an operational level, the Food Data Unit deemed it unreasonable to ask its regional food network partners—many of whom are small, community-based organizations without significant staffing or resources—to change the way they did data reporting or take on new data reporting processes during a crisis.

Therefore, the Food Data Unit decided to simply use what data was available and not ask partners to significantly change or add to their workflows. Instead, the Data Unit build a system that could collect, normalize, and standardize data for analysis and use by the City EOC Leadership and regional food network partners.

Data Collection, Normalization, and Standardization

The Food Data Unit focused on collecting data and normalizing to allow for unified analysis. This involved all three of people, process, and technology to create this capability (see Figure 4).

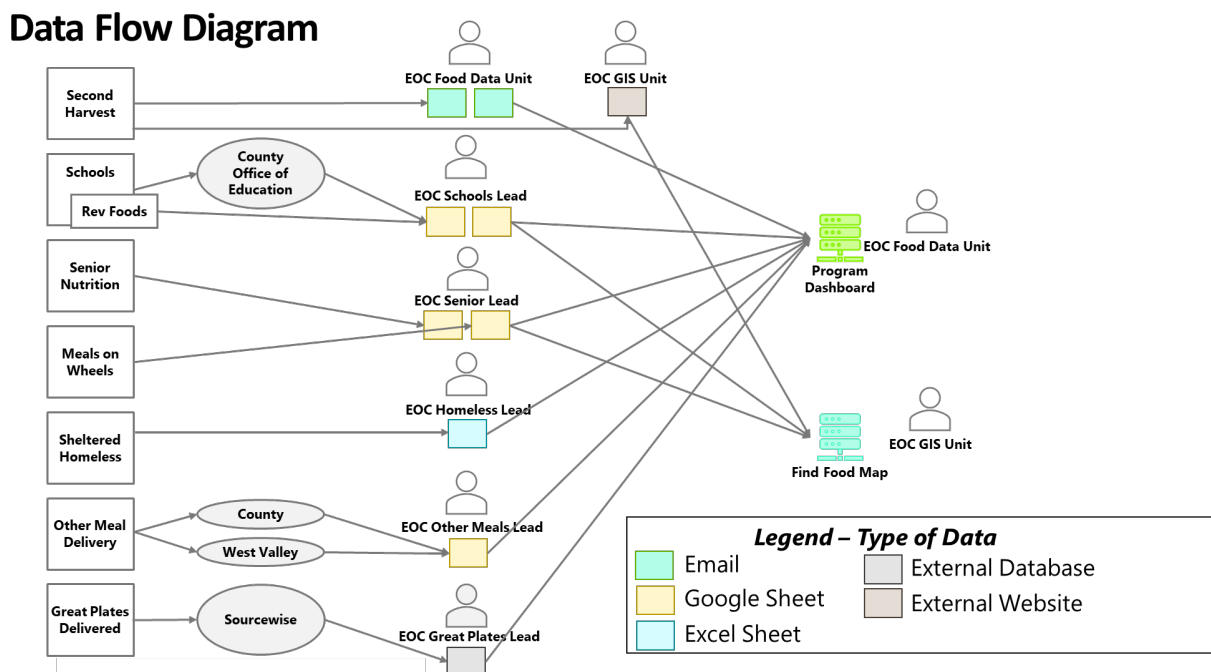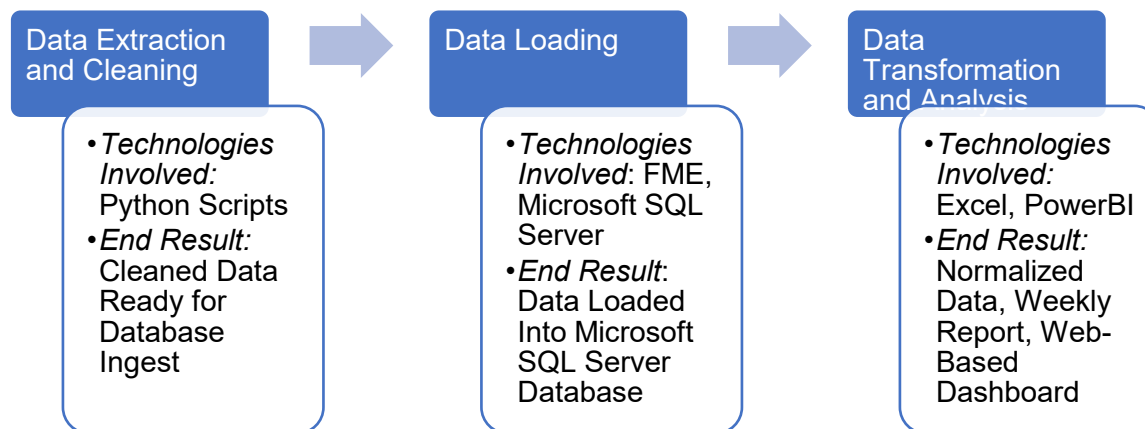*Figure 4. Data Flow Diagram Showing People, Process, and Technology for Food Data Unit.*

The data for each channel was owned by a single person, who was responsible for ensuring its collection, integrity, and timeliness at the source of the raw data (shown in the left-hand side of the graph). After the data was entered, the Food Data Unit used a combination of technology tools to collect, normalize, and

standardize (right-hand side of the graph). The generalized process involved first extracting and cleaning the data using Python scripts, loading data into a Microsoft SQL server database, and then transforming the data into normalized forms that could be used for key deliverables such as the weekly food distribution report and a web-based dashboard.

Data Extraction and Cleaning	Data Loading	Data Transformation and Analysis
• *Technologies Involved:* Python Scripts • *End Result:* Cleaned Data Ready for Database Ingest	• *Technologies Involved*: FME, Microsoft SQL Server • *End Result*: Data Loaded Into Microsoft SQL Server Database	• *Technologies Involved:* Excel, PowerBI • *End Result:* Normalized Data, Weekly Report, Web-Based Dashboard

Data Normalization

During this process, data from all channels was transformed from its raw form to a normalized form that included the following key fields:

- *Site id*: site where food was distributed
    - (site ids were created to standardize site names across data sources)
- *Site name*: site where food was distributed
- *City*: city where food was distributed
- *Reporting date*: date when food was distributed
- *Reporting week*: week when food was distributed (Friday following the reporting date)
- *Total meals*: Meals distributed
- *Channel*: Distribution channel that meals were a part of

For meals that were distributed to individuals, the *Site id* and *Site Name* fields were both replaced with anonymous participant ids, as no personally identifiable information (PII), including names, were kept or stored as part of this process.

Visualization and Analysis

Normalized and standardized data provides the backbone for easy and flexible visualization and analysis. The Food Data Unit produced two main analysis deliverables: (i) a weekly dashboard showing high-level

reporting on food distribution and levels of food insecurity; and (ii) a web-based dashboard that allowed more detailed analysis by individual users.

The weekly dashboard was built in Excel, using a built-in SQL query that automatically refreshed data in the dashboard based on the extract, load, and transform process detailed above. Each week, a dashboard with up to date data displayed the following key pieces of analysis (see Figure 5):

- Meals provided through each channel

- Comparison of meals provided compared to the previous week

- Comparison of meals provided compared to trend of previous 3 months

- Qualitative notes to explain any unexpected or new variations and changes

Food Distribution Dashboard and Graph - City of San José				Date: 11/13/2020	
Current Meals Delivered	Daily Meals [2]	Weekly Meals	Week-Over-Week Change	3-Month Trajectory	Notes
Channel	#	#	%		
Second Harvest to Community Organizations Estimate of Meals for San José	170,357	1,192,500	-4%		
Senior Nutrition Program (SNP) Sites Within the City of San José	2,002	10,010	-16%		Decrease due to Veterans' Day Holiday on Wednesday 11/11.
Senior Meals On Wheels (MOW) Meals Delivered in San José	3,042	15,211	+1%		
School Sites School Sites Within San José	22,026	110,132	-55%		Week-to-week increases and decreases due to inconsistent reporting. Includes meals served at ROCK n' Learn program sites provided by school districts.
City/County Targeted "Homeless" Placements [1] Residents of San José	2,217	15,517	-2%		Reporting of meals for San José residents based on data provided by Santa Clara County regarding residency of motel and shelter occupants for Mar-Sep.
Meal and Non-Second Harvest Grocery Delivery (CBOs, At-Risk Populations) Meals and Groceries Delivered in San José	482	2,409	-	-	Includes meal and grocery box distribution from contract with Off the Grid starting in November 2020. Also inclues 40 meals from Veggielution delivered to Mayfair neighborhood (95116) in partnership with Amigos de Guadalupe.
Great Plates Delivered Participants Within San José	1,492	7,460	-		CalOES and FEMA funding has been extended to December 8. City is backstopping program funding through January 9.
MEALS DELIVERED IN PAST WEEK [1]	201,618	1,353,239			

[1] Vulnerable homeless, isolation, and quarantine needs are included in the above estimates because it will be serviced through a combination of the above channels.

[2] Daily Meals are calculated based on 5 days a week, except Homeless placement for which we deliver meals 7 days a week.

Figure 5. Sample of Weekly Food Distribution Dashboard.

The web-based dashboard, built in PowerBI, used the same data from the Microsoft SQL Server database. It displayed both a summary view and more detailed views for each of the channels (See Figure 6 for an example). All data for the dashboards came from the Microsoft SQL Server database, which was refreshed on a weekly basis in accordance with the weekly report.

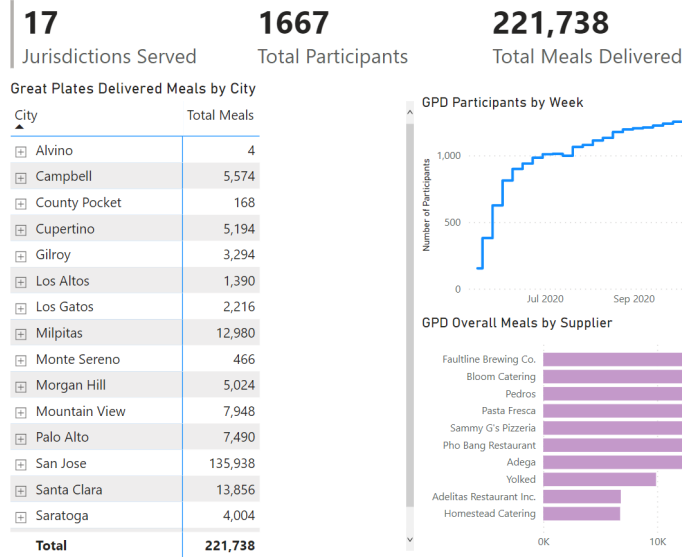**Summary of Great Plates Delivered Meals - COVID-19 Response**

17 Jurisdictions Served **1667** Total Participants **221,738** Total Meals Delivered

Great Plates Delivered Meals by City

City	Total Meals
Alvino	4
Campbell	5,574
County Pocket	168
Cupertino	5,194
Gilroy	3,294
Los Altos	1,390
Los Gatos	2,216
Milpitas	12,980
Monte Sereno	466
Morgan Hill	5,024
Mountain View	7,948
Palo Alto	7,490
San Jose	135,938
Santa Clara	13,856
Saratoga	4,004
Total	**221,738**

GPD Participants by Week

GPD Meals Per Week

GPD Overall Meals by Supplier

(Faultline Brewing Co., Bloom Catering, Pedros, Pasta Fresca, Sammy G's Pizzeria, Pho Bang Restaurant, Adega, Yolked, Adelitas Restaurant Inc., Homestead Catering)

Figure 6. Sample of Detailed Reporting on Web-Based Dashboard.

In addition to this visualization and analysis, this data was also used to support analysis for cost recovery. As the City of San José had taken countywide responsibility for food distribution during the COVID-19 emergency, the City worked closely with other jurisdictions in the County, as well as federal and state emergency management agencies, to recover any costs that could be legally reimbursed by those entities. Detailed data on the distribution of food throughout the pandemic was critical to supporting these cost recovery efforts by ensuring that invoices received from the City's partners and vendors could be checked against data on food and meals distributed to specific individuals and sites. The accuracy and specificity of this data allowed for transparency to other organizations (see Figure 7 for an example of data provided to other cities in the County to aid with cost recovery).

Program	Meals – Total	Meals - Existing Programs	Meals – New Programs	Cost – New Programs	Referral Source and Eligibility	Sites
Second Harvest and CBOs	1,315,385	1,315,385	-	-	All Low-Income Communities	300+ CBOs Countywide
Senior Nutrition Program	12,932	12,932	-	-	County Social Services Agency, Open to Ages 60+	Self-Help for the Elderly, Campbell Senior Nutrition
Senior Meals on Wheels	15,639	15,639	-	-	County Social Services Agency, Open to Ages 60+	Home Delivery
School Sites – Existing Eligible Students	172,729	172,729	-	-	National School Lunch Program	All Schools
School Sites – Evenings, Weekends, All Ages	57,781	-	57,781	$171,334.50	Santa Clara County Office of Education	Capri, Castlemont, Rosemary, Sherman Oaks
Targeted Homeless Placements	6,857	-	6,857	$41,289.23	County Homeless Program	Meals Delivered to Individuals
Great Plates Delivered	3,310	-	3,310	$3,517.04	Per state criteria: age 60-64 at COVID risk, age 65+	Home Delivery; 39 participants to date
Other Meal and Grocery Delivery	3,149	-	3,149	$22,368.04	Senior Meals on Wheels: Catholic Charities	Catholic Charities
SUBTOTAL (3/16 – 9/30)	**1,587,782**	**1,516,685**	**71,097**	**$238,508.81**		
MANAGEMENT AND ADMINISTRATIVE COSTS				**$35,513.96**		
TOTAL COST (3/16 – 9/30)				**$274,022.78**		

Figure 7. Example of Cost Recovery Analysis.

Insights

"Data by itself is meaningless. However, from data we can see patterns, and from patterns we can derive insights, which in turn lead to action," says Sri Shivananda, Chief Technology Officer at PayPal. Indeed, the large amount of work that went into collecting, extracting, normalizing, and loading data was only valuable to the communities of San José and Santa Clara County, because it ultimately led to action to stave off a widespread food crisis. Key insights derived from data enabled leaders to understand the increased amount of food insecurity occurring because of COVID-19, and to see that that insecurity was concentrated in at-risk and vulnerable communities. Some of the most important insights derived from this data were:

- Food distribution increased 50% compared to pre-pandemic levels
- Food distribution increased to levels higher than seen during the Great Recession of 2009-2010.
- Demand was particularly high among at-risk communities including: seniors, low-income, medically vulnerable, and homeless populations.

Thanks to these insights and many others at more detailed levels, leaders within the City and its regional food network partners were able to tackle the potential widespread food crisis. Since the beginning of the pandemic, no significant gaps or lack of food availability has been reported throughout the regional food network, meaning that the City and its partners have been able to feed our community's most vulnerable when it mattered most.

Conclusions

Taking a data-driven approach to complex problems like a potential regional food crisis requires investing in creating standardized and easily accessible data. This investment takes work and requires all three of people, process, and technology to succeed. The benefits, however, are enormous. First and foremost, a data-driven approach enables more effective, efficient, and equitable service delivery, as was the case with the food distribution efforts of San José and its partners during the COVID-19 pandemic.

The benefits, however, do not stop there. Accurate and trusted data is often useful in areas beyond just its immediate intended use. In the case of food distribution, the data asset created was used not only in service of feeding the community, but also to:

- Support cost recovery efforts to ensure the fiscal health and stability of the City and its partners;
- Track the climate impact of the City's food distribution efforts in coordination with its Climate Smart Program;

- Analyze the potential effects of rental assistance and eviction moratoriums by providing measures of economic insecurity; and

- Reduce climate pollutants by supporting the City's compliance with State Bill 1383, which aims to tackle the climate consequences of food and other waste.

Data Efforts Pay Off In More Ways Than One

| Feed Our Most Vulnerable | Protect our Fiscal Health | Track Our Climate Impact | Protect Residents From Eviction | Reduce Climate Pollutants |

In sum, the investment in being data-driven *is* an investment—it requires people, process, technology, and concerted effort over time. In the case of food distribution, however, it was clearly an investment well worth making.