

How the Commodity Flow Survey Made its First 100 Million...Shipments

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Commodity Flow Survey

Introduction

- Commodity Flow Survey (CFS) Overview
- Impetus for change
- 2021 CFS Pilot
- CFS Changes for 2022
- Outcomes

Commodity Flow Survey

Conducted through a partnership among...



Bureau of
Transportation
Statistics



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Overview

- Data on the movement of goods within the United States
- Every 5 years (years ending in “2” and “7”) as part of the Economic Census (mandatory)
 - 1993, 1997, 2002, 2007, 2012, and 2017
 - 2022 CFS in the field April 2022 – June 2023
- Shipper-based survey (not carrier-based)
- Establishment-based (location)
- Main input to BTS’s Freight Analysis Framework
- Data on hazardous materials packaging provided to PHMSA

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Overview Continued

- North American Industry Classification System (NAICS) coverage
 - Mining (except oil and gas extraction)
 - Manufacturing
 - Wholesale
 - Select Retail (electronic shopping, mail-order houses, fuel dealers)
 - Newspaper, periodical, book, and directory publishing
 - Selected auxiliary establishments (e.g., warehouses and company management offices) of multi-establishment companies

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Quarterly Questionnaire

- Shipment characteristics
 - Value (\$)
 - Weight (pounds)
 - Type of commodity (description)
 - Temperature controlled (Y/N)
 - Hazardous material number (UN/NA)
 - Domestic destination (city, state, zip)
 - Domestic mode of transportation
 - Export destination (city, country)
 - Export mode of transportation

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Publication Data

- Shipments by....
 - Origin-Destination-Commodity-Mode
 - Value, Tons, Ton-miles, Average miles per shipment
 - Industry, Temperature control, Hazmat, Exports
- Data
 - <https://census.gov/cfs>

Impetus for Change

- **Data user requests**
 - More localized geography estimates
 - More commodity detail

- **How can we publish more detailed data?**
 - Small Area Estimation
 - Disaggregation/modelling
 - Collect more data

Impetus for Change

Data collection constraints

- Respondent burden
- More data -> more burden... right?

Can we collect and publish more detailed data without increasing burden?

2017 CFS – Promising signs

Feedback from 2017 CFS respondents

- Unnecessary burden / pain points

Reported burden

- Analysis of reported burden

2017 CFS – Median burden vs. # of shipments provided

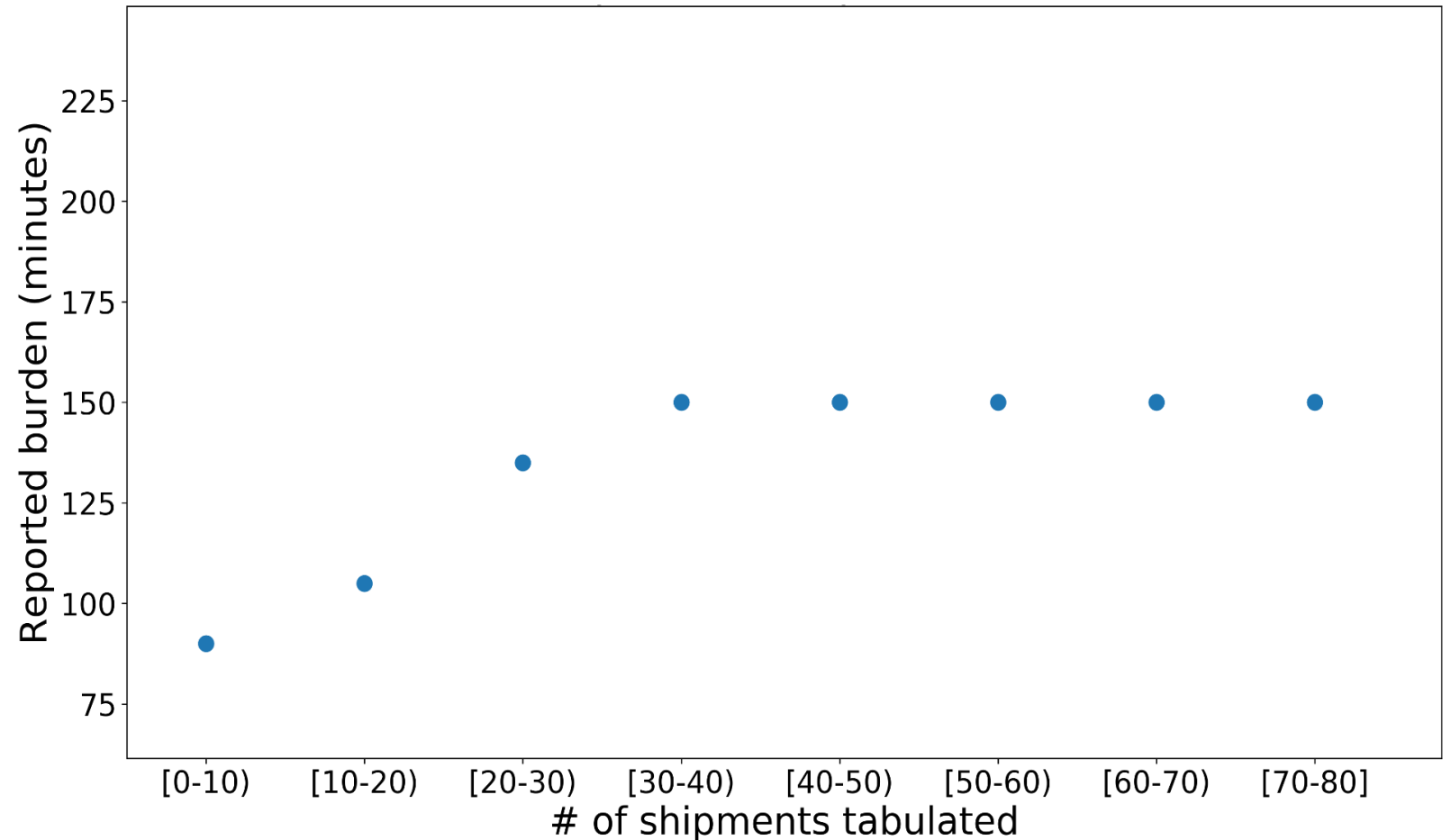
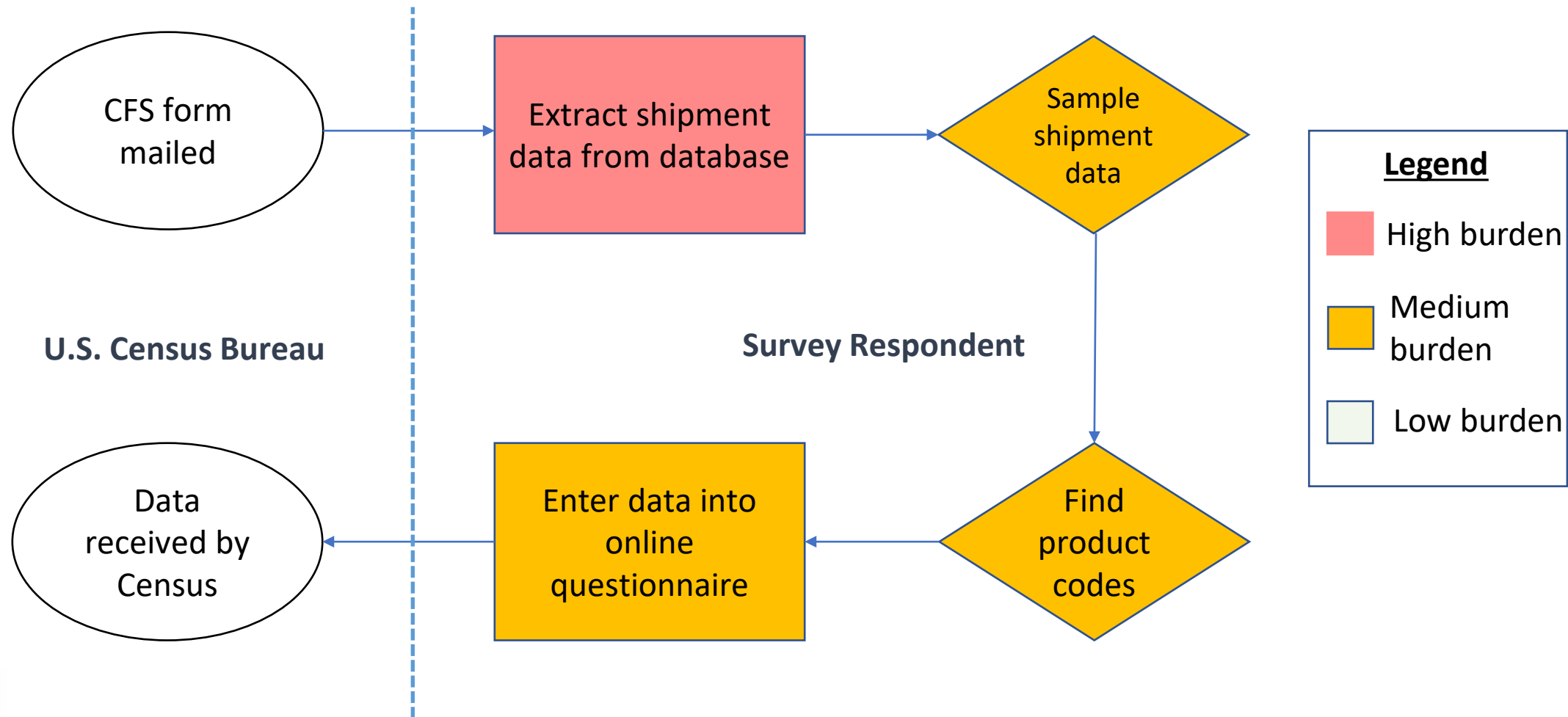
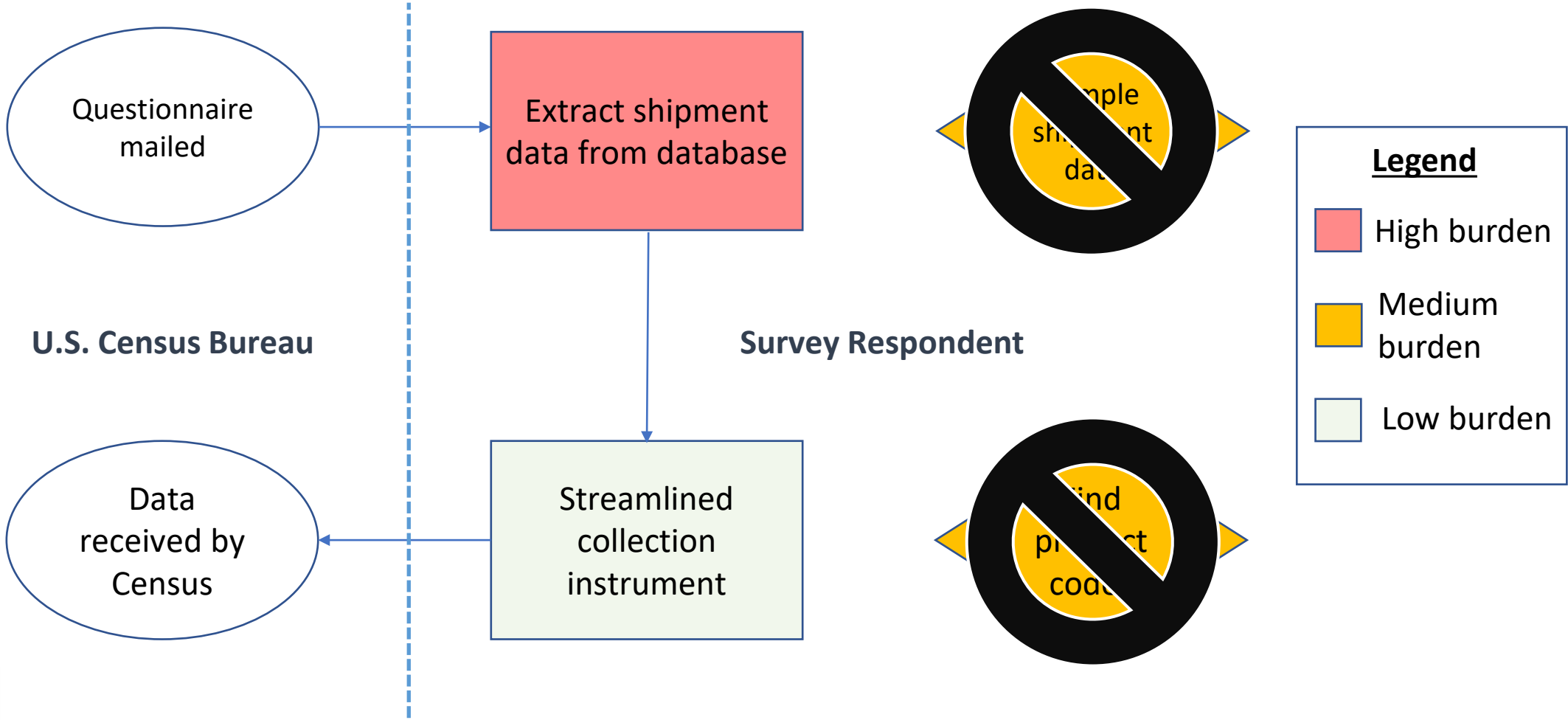


Figure: Median reported burden vs. number of tabulated shipments provided by a respondent

2017 CFS -- Burden Analysis



2021 CFS Pilot



2021 CFS Pilot – Machine Learning validation

Fix Error

Row #	19
Facility ID	MFGSITE37
Date	8/10/2020
Dest. City	Oakland
Dest. State	CA
Dest. ZIP	94601
Value	1115
Weight	1854
Desc.	Recoil-Free Specialized Size

Which of these categories best describes this product?

- Other Printed products, not elsewhere classified, including blank books, binders, and albums
- Hardware or plumbing supplies
- Taps, cocks, valves, and similar appliances for pipes, boiler shells, tanks and vats, or the like, including those for use in plumbing
- Plastics plates, sheets, film, foil, tape, strip, and other flat shapes, including combinations with other materials
- Plastics tubes, pipes, hoses, and fittings, including joints, elbows, and flanges
- None of these. Please describe.

Submit and Continue

1 of 10

Skip

MFGSITE37	8/10/2020	IL	2314	Danze Pull-Out Spray Head	Validate product
MFGSITE37	8/10/2020	NY	1065	62GB2393P20 Mack Connecting Rod Bearing Set	Validate product

2021 CFS Pilot -- results

Data Collected

Summary

- **Respondents who provided at least 1 shipment:** 30
- **Shipments:** 16,000
- **Locations:** 150
- **Avg shipments / location:** 106
 - vs. *max* of 80 in 2017 CFS

Burden

By establishment

- **2017 CFS:** 2.5 hours / location
- **2021 pilot:** 30 minutes / location
 - 80% reduction

Data quality

Product code machine learning

- Confidently classify 95% of shipments

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2022 Collection Changes (Pilot Tested)

- Respondents given the option to provide all shipments in 2022
- Machine learning now codes commodity descriptions
- Consolidated reporting

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2022 Results vs. 2017: Data

- Collected about 106 million shipments (6.5 million 2017)
- Approximately same number of contributing establishments each cycle – 60,000
- Unique origin-destination ZIP pairs – 2022: 5.1 mil; 2017: 2.4
 - 2x increase in O/D pairs
- Unique origin-destination-commodity-mode combinations:
 - 13M in 2022, 3.1M in 2017
 - 4x increase

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2022 Results vs. 2017: Burden

- Burden:
 - Among respondents who reported at least 1 shipment for a single location: **no increase in burden** (2.5 hours / establishment, same as 2017)
 - Among respondents who reported at least 1 shipment for multiple locations: **15% reduction** (2.1 hours / establishment)

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2022 Outcomes

- **Over 100 million shipments** = 16x more data to use in estimates
 - More publishable aggregate data cells
 - More robust public use shipment file
- Asking for more shipments did not increase respondent burden
 - Most burden in reporting first shipment. Additional shipments have little burden
- Companies with many CFS locations really liked consolidated reporting
- Removing paper option did not change # of locations who provided usable data

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Next Steps

- The CFS data release in 2025 will show the impact 106 million shipments have on the published estimates
- Shipment diversity?
- Future CFS?
- Data users gaining access through the Federal Statistical Research Data Centers (FSRDC)
 - <https://census.gov/fsrdc>

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