Linking CPS (to CPS and ATUS): A Brief Overview

Sarah Flood, PhD

Housekeeping Items

- This webinar will be recorded
- Questions
  - Designated time for substantive questions
  - Use the Q&A for all questions
  - We plan to provide written responses to all questions received in ~ 1 week
- After the webinar
  - Evaluation form
  - Link to the recording
  - List of resources
  - Responses to all questions

Two-Part Webinar

1. Linking CPS data across months

2. Linking ATUS to CPS data

Part 1: Linking CPS data

- What's in the CPS
- Two main challenges (and what IPUMS does to address them)
  - Rotation pattern
  - Linking keys
- Why link the CPS
- Questions

Part 2: Linking ATUS to CPS Data

1. What's in the ATUS

2. How ATUS can be linked to CPS

3. Additional considerations

4. Questions

Acknowledgements

- Support from NICHD enables IPUMS CPS and IPUMS ATUS to do this work

- IPUMS colleagues
  - Research: Julia Drew, Rob Warren, Renae Rodgers, Jose Pacas, Devon Kristiansen
  - IT: Monty Hindman, Ben Klaas

- Former ATUS collaborators
  - Katharine Abraham, Betsy Thorn

Part 1: CPS to CPS Linking

Part 1: CPS to CPS Linking

A. WHAT'S IN THE CPS

Overview

- CPS Basic Monthlies

- CPS Supplements
  - Annual Social and EConomic Supplement
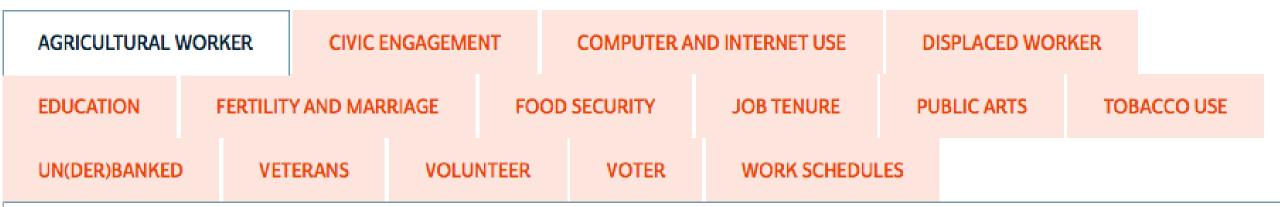
What's in a Basic Monthly?

- Household characteristics

- Geographic location

- Demographic characteristics

- Labor force participation (week including the 12th)

- A subset answer additional questions

Supplements

AGRICULTURAL WORKER	CIVIC ENGAGEMENT	COMPUTER AND INTERNET USE	DISPLACED WORKER
EDUCATION	FERTILITY AND MARRIAGE	FOOD SECURITY	JOB TENURE	PUBLIC ARTS	TOBACCO USE
UN(DER)BANKED	VETERANS	VOLUNTEER	VOTER	WORK SCHEDULES

+ ASEC

ASEC vs. Basic Monthly

- In addition to basic monthly data, ASEC contains:

  – Income, taxes, health insurance, government subsidies, migration

  – Labor force information about *last calendar year*

Part 1: CPS to CPS Linking

B. LINKING CHALLENGE #1
ROTATION PATTERN

CPS Panel Component

- Individuals within households are observed up to 8 times over 16 months

- Individuals move through the survey in a 4-8-4 rotation
  - Given predictable movement through the survey and linking keys, you can construct a short panel combining information across months and supplemental topics

- CPS is NOT a longitudinal survey that follows one or several cohorts as they age

- Because this is a household survey, if individuals move out of the household, they are not followed; new household members are interviewed

Rotation Pattern

- 4-8-4
- In **4** months
  - MIS 1, 2, 3, 4

Month-in-sample – MIS
The way CPS indexes where a household is in the CPS rotation pattern

- Out **8** months
  - No MIS values because not in survey

Outgoing Rotation Groups – ORG
The special name for groups of individuals who are exiting the CPS rotation

- In **4** months
  - MIS 5, 6, 7, 8

Year X

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Year X

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A	A										

Year X

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A	A	A									

Year X

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A	A	A	A								

Year X

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Year X+1

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Year X

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Year X+1

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Year X

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Year X+1

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Year X

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Year X+1

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Year X

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A1	A2	A3	A4								

Year X+1

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A5	A6	A7	A8								

Year X

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Year X+1

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Year X

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Year X+1

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Year X

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ZZ6	O6	P6	Q6	R6	S6	T6	U6	V6	W6	X6	Y6
YY7	ZZ7	O7	P7	Q7	R7	S7	T7	U7	V7	W7	X7
XX8	YY8	ZZ8	O8	P8	Q8	R8	S8	T8	U8	V8	W8

Year X+1

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
AA1	BB1	CC1	DD1	EE1	FF1	GG1	HH1	II1	JJ1	KK1	LL1
L2	AA2	BB2	CC2	DD2	EE2	FF2	GG2	HH2	II2	JJ2	KK2
K3	L3	AA3	BB3	CC3	DD3	EE3	FF3	GG3	HH3	II3	JJ3
J4	K4	L4	AA4	BB4	CC4	DD4	EE4	FF4	GG4	HH4	II4
A5	B5	C5	D5	E5	F5	G5	H5	I5	J5	K5	L5
Z6	A6	B6	C6	D6	E6	F6	G6	H6	I6	J6	K6
Y7	Z7	A7	B7	C7	D7	E7	F7	G7	H7	I7	J7
X8	Y8	Z8	A8	B8	C8	D8	E8	F8	G8	H8	I8

Year X

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
A1	B1	C1	D1	E1	F1	G1	H1	I1	J1	K1	L1
Z2	A2	B2	C2	D2	E2	F2	G2	H2	I2	J2	K2
Y3	Z3	A3	B3	C3	D3	E3	F3	G3	H3	I3	J3
X4	Y4	Z4	A4	B4	C4	D4	E4	F4	G4	H4	I4
O5	P5	Q5	R5	S5	T5	U5	V5	W5	X5	Y5	Z5
ZZ6	O6	P6	Q6	R6	S6	T6	U6	V6	W6	X6	Y6
YY7	ZZ7	O7	P7	Q7	R7	S7	T7	U7	V7	W7	X7
XX8	YY8	ZZ8	O8	P8	Q8	R8	S8	T8	U8	V8	W8

Year X+1

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
AA1	BB1	CC1	DD1	EE1	FF1	GG1	HH1	II1	JJ1	KK1	LL1
L2	AA2	BB2	CC2	DD2	EE2	FF2	GG2	HH2	II2	JJ2	KK2
K3	L3	AA3	BB3	CC3	DD3	EE3	FF3	GG3	HH3	II3	JJ3
J4	K4	L4	AA4	BB4	CC4	DD4	EE4	FF4	GG4	HH4	II4
A5	B5	C5	D5	E5	F5	G5	H5	I5	J5	K5	L5
Z6	A6	B6	C6	D6	E6	F6	G6	H6	I6	J6	K6
Y7	Z7	A7	B7	C7	D7	E7	F7	G7	H7	I7	J7
X8	Y8	Z8	A8	B8	C8	D8	E8	F8	G8	H8	I8

Year X

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
A1	B1	C1	D1	E1	F1	G1	H1	I1	J1	K1	L1
Z2	A2	B2	C2	D2	E2	F2	G2	H2	I2	J2	K2
Y3	Z3	A3	B3	C3	D3	E3	F3	G3	H3	I3	J3
X4	Y4	Z4	A4	B4	C4	D4	E4	F4	G4	H4	I4
O5	P5	Q5	R5	S5	T5	U5	V5	W5	X5	Y5	Z5
ZZ6	O6	P6	Q6	R6	S6	T6	U6	V6	W6	X6	Y6
YY7	ZZ7	O7	P7	Q7	R7	S7	T7	U7	V7	W7	X7
XX8	YY8	ZZ8	O8	P8	Q8	R8	S8	T8	U8	V8	W8

Year X+1

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
AA1	BB1	CC1	DD1	EE1	FF1	GG1	HH1	II1	JJ1	KK1	LL1
L2	AA2	BB2	CC2	DD2	EE2	FF2	GG2	HH2	II2	JJ2	KK2
K3	L3	AA3	BB3	CC3	DD3	EE3	FF3	GG3	HH3	II3	JJ3
J4	K4	L4	AA4	BB4	CC4	DD4	EE4	FF4	GG4	HH4	II4
A5	B5	C5	D5	E5	F5	G5	H5	I5	J5	K5	L5
Z6	A6	B6	C6	D6	E6	F6	G6	H6	I6	J6	K6
Y7	Z7	A7	B7	C7	D7	E7	F7	G7	H7	I7	J7
X8	Y8	Z8	A8	B8	C8	D8	E8	F8	G8	H8	I8

Table 3-6. Proportion of Sample in Common for 4-8-4 Rotation System

Interval (in months)	Percent of sample in common between the 2 months
1	75
2	50
3	25
4-8	0
9	12.5
10	25
11	37.5
12	50
13	37.5
14	25
15	12.5
16 and greater	0

Source: CPS Technical Paper 66 (https://www.census.gov/prod/2006pubs/tp-66.pdf)

How IPUMS Helps

- Webinars and trainings

- Extensive documentation

- Interactive tool: RoPES

  - Easily *see* CPS rotation pattern

  - Explore what topical supplements can be examined together

https://cps.ipums.org/cps/

IPUMS CPS

CURRENT POPULATION SURVEY

HOME | SELECT DATA | MY DATA | SUPPORT

IPUMS CPS
ABOUT
REGISTER
DONATE TO IPUMS

DATA
BROWSE AND SELECT DATA
ANALYZE DATA ONLINE
DOWNLOAD OR REVISE MY DATA

DOCUMENTATION
COVID-19 AND CPS
SAMPLE DESCRIPTIONS
TECHNICAL DOCUMENTS
LINKING THE CPS
REVISION HISTORY

SUPPORT
FAQ
VIDEO TUTORIALS
USER FORUM
TRAINING MATERIALS

RESEARCH

CURRENT POPULATION SURVEY DATA FOR SOCIAL, ECONOMIC AND HEALTH RESEARCH

IPUMS CPS harmonizes microdata from the monthly U.S. labor force survey, the Current Population Survey (CPS), covering the period 1962 to the present. Data include demographic information, rich employment data, program participation and supplemental data on topics such as fertility, tobacco use, volunteer activities, voter registration, computer and internet use, food security, and more.

USE IT FOR GOOD -- NEVER FOR EVIL

CREATE AN EXTRACT

Get Data
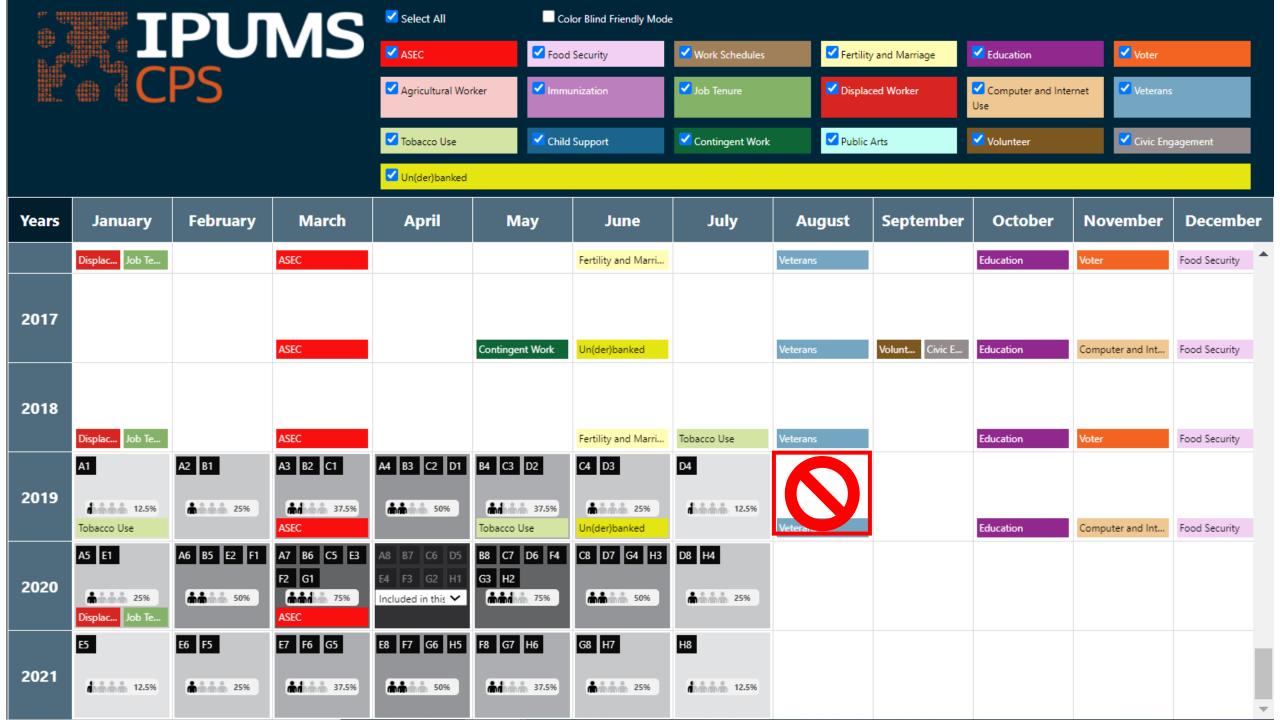
USE OUR ONLINE TOOL FOR ANALYSIS

Analyze Data Online

EXPLORE CPS FILE LINKAGES

View RoPES

IPUMS CPS

- [x] Select All
- [ ] Color Blind Friendly Mode

- [x] ASEC
- [x] Food Security
- [x] Work Schedules
- [x] Fertility and Marriage
- [x] Education
- [x] Voter
- [x] Agricultural Worker
- [x] Immunization
- [x] Job Tenure
- [x] Displaced Worker
- [x] Computer and Internet Use
- [x] Veterans
- [x] Tobacco Use
- [x] Child Support
- [x] Contingent Work
- [x] Public Arts
- [x] Volunteer
- [x] Civic Engagement
- [x] Un(der)banked

Years	January	February	March	April	May	June	July	August	September	October	November	December
	Displac... Job Te...		ASEC			Fertility and Marri...		Veterans		Education	Voter	Food Security
2017			ASEC		Contingent Work	Un(der)banked		Veterans	Volunt... Civic E...	Education	Computer and Int...	Food Security
2018	Displac... Job Te...		ASEC			Fertility and Marri...	Tobacco Use	Veterans		Education	Voter	Food Security
2019	A1 12.5% Tobacco Use	A2 B1 25%	A3 B2 C1 37.5% ASEC	A4 B3 C2 D1 50%	B4 C3 D2 37.5% Tobacco Use	C4 D3 25% Un(der)banked	D4 12.5%	🚫 Veterans		Education	Computer and Int...	Food Security
2020	A5 E1 25% Displac... Job Te...	A6 B5 E2 F1 50%	A7 B6 C5 E3 F2 G1 75% ASEC	A8 B7 C6 D5 E4 F3 G2 H1 Included in this ⌄	B8 C7 D6 F4 G3 H2 75%	C8 D7 G4 H3 50%	D8 H4 25%					
2021	E5 12.5%	E6 F5 25%	E7 F6 G5 37.5%	E8 F7 G6 H5 50%	F8 G7 H6 37.5%	G8 H7 25%	H8 12.5%					

Part 1: CPS to CPS Linking

C. LINKING CHALLENGE #2 LINKING KEYS

Linking Keys 1989+

January 1989 to December 1993	January 1994 to April 2004	May 2004 +
HRHHID	HRHHID	HRHHID
PULINENO	PULINENO	PULINENO
STATEFIPS	STATEFIPS	STATEFIPS
HUHHNUM	HUHHNUM	
	HRSAMPLE	HRHHID2
	HRSERSUF	

**Transformations detailed in Drew, Flood & Warren 2014

How IPUMS helps

CPSID(P)

CPSID(P)

- Bridges changes in variable names as well as the technical aspects of how to link
- Every time we observe a set of linking keys (or bridged linking keys) across files, we assign a single CPSID(P) value
  - CPSID – a consistent HOUSEHOLD identifier
  - CPSIDP – a consistent PERSON identifier
- Can use CPSID(P) to merge records in different months or to group them together in the same file – create a person-time file in long format

cpsidp	year	month	mish	hrhhid	hrhhid2	lineno
20190100006001	2019	January	One	26001045006781	9011	1
20190100006001	2019	February	Two	26001045006781	9011	1
20190100006001	2019	March	Three	26001045006781	9011	1
20190100006001	2019	April	Four	26001045006781	9011	1
20190100006001	2020	January	Five	26001045006781	9011	1
20190100006001	2020	February	Six	26001045006781	9011	1
20190100006001	2020	March	Seven	26001045006781	9011	1
20190100006001	2020	April	Eight	26001045006781	9011	1
20190100006002	2019	January	One	26001045006781	9011	2
20190100006002	2019	February	Two	26001045006781	9011	2
20190100006002	2019	March	Three	26001045006781	9011	2
20190100006002	2019	April	Four	26001045006781	9011	2
20190100006002	2020	January	Five	26001045006781	9011	2
20190100006002	2020	February	Six	26001045006781	9011	2
20190100006002	2020	March	Seven	26001045006781	9011	2
20190100006002	2020	April	Eight	26001045006781	9011	2

A Quick Word on Validation

- CPSIDP is a mechanical match

- Best practice to check linkages based on age, sex, race

- We are doing QA on a linking key that makes linkages only for linkages that we consider valid

A Quick Word on Weights

- With one exception, the Census Bureau only provides cross-sectional weights

- Weights are a concern because of panel attrition in the CPS
  - Gets more severe as more time passes between observations

- We have constructed a preliminary set of test weights for use with linked data
  - Idea is for subset of individuals who *actually* link to be representative of the subset of who *should* link

Part 1: CPS to CPS Linking

D. WHY LINK THE CPS

CPS Panel Benefits

- Large sample sizes
- Good coverage of subpopulations
- Short-run changes in employment and families; reactions to births and losses (death, divorce)
- Potential to combine rich sources of information about different topics
  - Work and volunteering; veterans and employment

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Same Month One Year Apart

- Useful for studying year-to-year change
  - Earnings and employment dynamics
  - Movement into and out of labor unions
- Expected linkage rates:

	March 1994-95	March 2009-10
Linked N	48,140	53,486
Retention Rate	69.4%	78.8%

Single Cohort, All 8 Months

- Useful for studying short-term dynamics
  - Change in economic arrangements as a function of social and demographic characteristics
  - Changes in these relationships over time
- Expected linkage rates:

Cohort Entering	January 1994	January 2009
Linked N	10,069	11,528
Retention Rate	59.7%	68.0%

Part 1: CPS to CPS Linking

QUESTIONS?

Part 2: ATUS to CPS Linking

Part 2: ATUS to CPS Linking

A. WHAT'S IN THE ATUS

What is ATUS?

- Time diary survey funded by BLS
- Fielded annually since 2003
- Samples individuals 15+
- ~12,000 people per year
- Respondents report
  - All of the activities they engage in starting at 4am yesterday and ending at 4am today
  - Where they were, who they were with, and whether they were engaged in childcare or eldercare at the same time

Part 2: ATUS to CPS Linking

HOW ATUS CAN BE LINKED TO CPS

How is ATUS related to CPS?

- CPS is the sampling frame for ATUS

- ATUS respondents are drawn from households that have completed the final CPS interview (MIS 8)

- One person aged 15+ per selected CPS household is invited to participate in the ATUS

- ATUS interview is conducted 2-5 months after final CPS interview

ATUS to CPS Use Cases

1. Use information from the final CPS interview to supplement what is in the ATUS
    - BLS makes the final CPS basic monthly interview data available WITH the ATUS
    - In IPUMS, these variables can be requested with the ATUS interview variables – look for _CPS8 variable name suffixes
2. Link ATUS to specific CPS supplements
3. Examine life course transitions and short-term employment histories

Another Layer of Complexity

- ATUS data are collected throughout the calendar year
- Final CPS interviews conducted in the previous calendar year and the year of ATUS interview

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2011								Final CPS Interview				
2012	Final CPS Interview / 2012 ATUS Respondents											

ATUS Linked to 2012 CPS ASEC

- 2012 ASEC respondents could exit CPS in March (MIS 8) and participate in ATUS as early as May

- 2012 ASEC respondents could be in MIS 5 in March, exit CPS in June, and participate in ATUS as late as November

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2011								Final CPS Interview				
2012			ASEC 2012	F		Eligible to Link to 2012 ASEC						

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ATUS Linked to CPS ASEC

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Cohort A MIS 5			ASEC	CPS	CPS	CPS		ATUS	ATUS	ATUS	ATUS	
Cohort B MIS 6		CPS	ASEC	CPS	CPS		ATUS	ATUS	ATUS	ATUS		
Cohort C MIS 7	CPS	CPS	ASEC	CPS		ATUS	ATUS	ATUS	ATUS			
Cohort D MIS 8	CPS	CPS	ASEC		ATUS	ATUS	ATUS	ATUS				

KEY
This is the CPS supplement of interest
These are months in addition to the supplement that ATUS respondents could have been in the CPS
These are months of eligibility to participate in the ATUS

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MIS Matters

ATUS Linked to CPS ASEC

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Cohort A MIS 5			ASEC	CPS	CPS	CPS		ATUS	ATUS	ATUS	ATUS	
Cohort B MIS 6		CPS	ASEC	CPS	CPS		ATUS	ATUS	ATUS	ATUS		
Cohort C MIS 7	CPS	CPS	ASEC	CPS		ATUS	ATUS	ATUS	ATUS			
Cohort D MIS 8	CPS	CPS	ASEC		ATUS	ATUS	ATUS	ATUS				

KEY
This is the CPS supplement of interest
These are months in addition to the supplement that ATUS respondents could have been in the CPS
These are months of eligibility to participate in the ATUS

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Link 2012 ATUS respondents to 2012 ASEC

2012 ATUS data

↓

2012 ASEC data
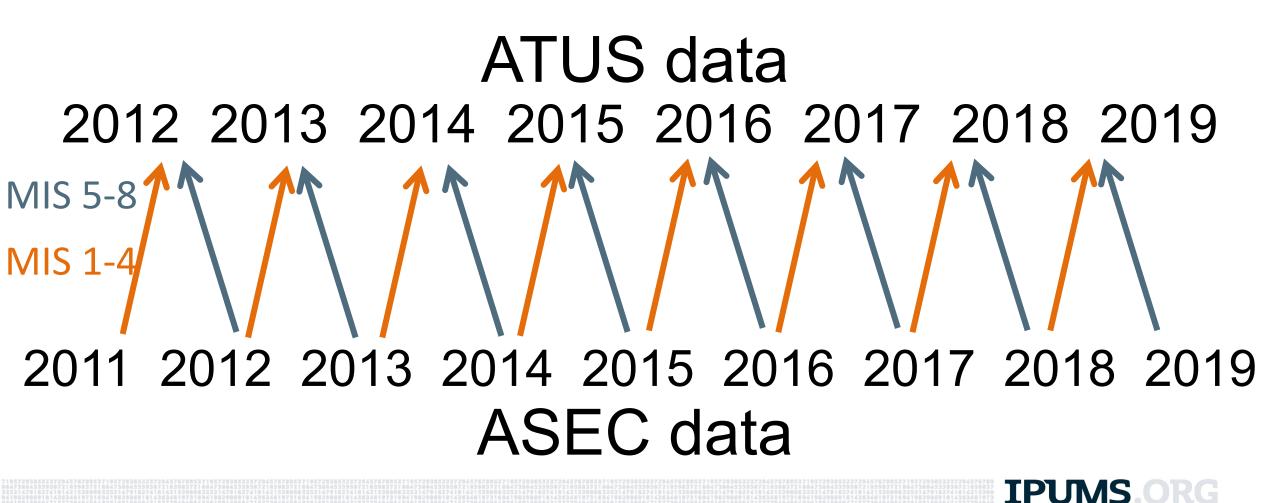
MIS Matters

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Year 1												
Cohort A, MIS 1			ASEC	CPS	CPS	CPS						
Cohort B, MIS 2		CPS	ASEC	CPS	CPS							
Cohort C, MIS 3	CPS	CPS	ASEC	CPS								
Cohort D, MIS 4	CPS	CPS	ASEC									
YEAR 2												
Cohort A, MIS 5			ASEC	CPS	CPS	CPS		ATUS	ATUS	ATUS	ATUS	
Cohort B, MIS 6		CPS	ASEC	CPS	CPS		ATUS	ATUS	ATUS	ATUS		
Cohort C, MIS 7	CPS	CPS	ASEC	CPS		ATUS	ATUS	ATUS	ATUS			
Cohort D, MIS 8	CPS	CPS	ASEC		ATUS	ATUS	ATUS	ATUS				

Link 2012-2019 ATUS respondents to ASEC

ATUS data

2012 2013 2014 2015 2016 2017 2018 2019

MIS 5-8

MIS 1-4

2011 2012 2013 2014 2015 2016 2017 2018 2019

ASEC data

Part 2: ATUS to CPS Linking

ADDITIONAL CONSIDERATIONS

CPSIDP

- CPS linking keys are on ATUS files

- Using same rules to generate CPSID(P) in CPS, we assign CPSID(P) to ATUS

Things to Consider

- Which CPS months/supplement do you want to link to ATUS respondents?

- Does it matter if that CPS observation is from month-in-sample 1-4 or 5-8?

How to Proceed

- Make an IPUMS CPS extract
  - Decide which MIS values you want to link to ATUS
  - Drop any records with MIS values you don't want to link to ATUS
- Make an IPUMS ATUS extract
- Merge files together using CPSIDP

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What to Expect

- Because of the CPS rotation pattern and the gap between the CPS and ATUS, only a subset of ATUS respondents will link to a specific CPS month
  - Even so non-response and migration may result in fewer linkages than expected
- One-to-one merges will only work if you've pruned the CPS data to ensure there is only one observation per person
- You may want to do manipulation of CPS and ATUS data prior to merging files together and rename variables to clearly indicate whether they are CPS or ATUS variables
  - Note that some variable names are in both the CPS and ATUS (e.g., AGE)

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A Quick Word on Weights

- Whether you link a specific supplement or a subset of CPS observations to the ATUS, you will not have data available for all ATUS respondents
  - ATUS weights are less than ideal in this case
- Solution: perform a weight adjustment on the linked data

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Part 2: ATUS to CPS Linking

QUESTIONS?

Resources – CPSID Papers

- CPSID – monthly data 1989 forward
  - Drew, Flood, & Warren 2014 (https://pubmed.ncbi.nlm.nih.gov/26113770/)
- CPSID – ASEC to March basic monthly 1989 forward
  - Flood & Pacas 2018 (https://pubmed.ncbi.nlm.nih.gov/29937619/)
- CPSID – monthly and ASEC data 1976 to 1988
  - Flood et al. forthcoming (https://assets.ipums.org/_files/ipums/working_papers/ipums_wp_2020-02_v2.pdf)

Resources – IPUMS Documentation and Training

- 2018 CPS Linking Workshop Presentations and Hands-on Exercises
  - https://cps.ipums.org/cps/cps_workshop2018_materials.shtml
- IPUMS CPS Linking page
  - https://cps.ipums.org/cps/cps_linking_documentation.shtml
- IPUMS ATUS Hands-on Exercise
  - https://www.atusdata.org/atus/resources/linked_docs/Training_Materials/Exercise_Estimates_Volunteering.pdf

Resources – Weights

- IPUMS CPS Documentation on Weights for Linked Data
  - https://cps.ipums.org/cps/cps_linking_documentation.shtml#linked_weights
- 2018 CPS Linking Workshop Presentation on Weights
  - https://cps.ipums.org/cps/resources/workshop_materials/weights_final.pptx
- IPUMS ATUS Documentation on Weights for Linked Data
  - https://www.atusdata.org/atus/resources/linked_docs/linked_generic.pdf