

Paradata and Dashboards in PIAAC

Leyla Mohadjer and Brad Edwards, Westat

Managing Data Quality in Large Scale Assessments

May 11-12

OECD

Paris, France

Overview

- Introduction to performance dashboards
- Evolution of paradata discovery dashboard at Westat
- Case study: U.S. implementation of first cycle of PIAAC, with a focus on detecting fabrication
- Future directions
- Summary and conclusions

Introduction to Performance Dashboards

Why Use a Dashboard?

- Enables the driver to keep moving while checking critical systems
- Dashboards decrease risk, increase efficiency
- Surveys can benefit from dashboards in many ways
- Survey operations in the PIAAC countries move very fast, run many risks in production, costs, and quality
- Performance dashboards can help the survey “drivers” monitor how they are doing and signal when something may be going off course

What Is a Dashboard?

A dashboard is a...

visual display of the

most important information

needed to achieve one or more objectives; consolidated on a

single screen

so the information can be monitored at a glance.

Stephen Few (2013)

Parsing the Definition

- A visual display
 - Expertise required to visualize information so the user can process it quickly and accurately; pre-attentive processing
- The most important information
 - User input required to help define it
 - Easy to err by providing too much information
 - Metrics are drivers, change agents to meet objectives
- On a single screen
 - Working memory can only hold 3 or 4 “objects” at a time

Business Dashboards

- Information explosion
- A tool, a communication medium, to control information
- Dashboards made their first appearance in business organizations in the 1990s
- For every good business dashboard, 1000s of bad
 - Dense array of data
 - Small screen real estate
 - Must leverage power of visual perception

Who Is the User?

- If the organization and its IT infrastructure is ready, the most important first step is determining the user
- Example: field supervisor on a household-based survey
- Best practices
 - Focus on one user type
 - Identify most important information to them
 - Prototype, test, iterate to incorporate feedback, enhance utility and user acceptance

Metrics and Key Performance Indicators (KPIs)

- Metrics are change agents
- KPIs are metrics that are directly tied to the overall objectives
- For household surveys in the field, two KPIs stand out:
 - Response rate
 - Hours (or cost) per completed interview
- Examples of other useful metrics at the survey level
 - Contact attempts per case or per complete
 - Completes minus goal

Performance Dashboards

- Clear, concise presentation of KPIs, other important metrics
 - Just the essentials, in the best way for the user to understand quickly
- Graphical interfaces to production systems: balance of standardization, flexibility
 - Customization of displays in real time
 - Support for actions
 - Drill-down capability
- Drive decision-making, and the power that comes with access to a number of large databases, down to managers

Encoding Data for Rapid Perception

How many 5's are there?

192793774596113394741848211766685146
934813766623772889789992481442556688
178734549894544522789238165341929987
518225955234674128639626239174389497

The Power of Pre-attentive Processing

Now how many 5's do you see?

192793774596113394741848211766685146
934813766623772889789992481442556688
178734549894544522789238165341929987
518225955234674128639626239174389497

Increasing Interest in Survey Dashboards

- Need to pull data from multiple sources
 - Paradata explosion
 - Decreasing response rates, increasing cost and quality pressure
 - Multiple modes
 - Responsive/Adaptive design
- Dashboards offer a solution
 - IT advances, increasingly rapid flow of information
 - Increased communication speed and modes
 - Survey professionals/managers' skill requirements

Paradata Management

- Many potential data sources: interview or assessment timings, case status, record of calls, payroll and expense data, interview notes, interviewer characteristics, audio files, keystroke files, location data
- Some are very large (GPS data are Big Data)
- Some may be unstructured (audio files, interviewer notes)
- Some have complex structures (**call record data** – many records for one case, case may spawn other cases, and case status data are hierarchical, draw from questionnaire status)
- Dashboard must be a single source of truth

Evolution of Performance Dashboards at Westat

Origins at Westat

- My perspective: face-to-face household surveys
- Recognizing paradata challenges (2005-2010)
 - Separate data bases, data flows for production, cost, and quality, complex structure
- Developing a solution for paradata structural complexity (“the Cube”) (2011-2015)
 - Reports for field supervisors
- M3: Response to multimode challenges (2012-2015)
- Clinical Trials Support Unit (CTSU) dashboard requirement (2014)

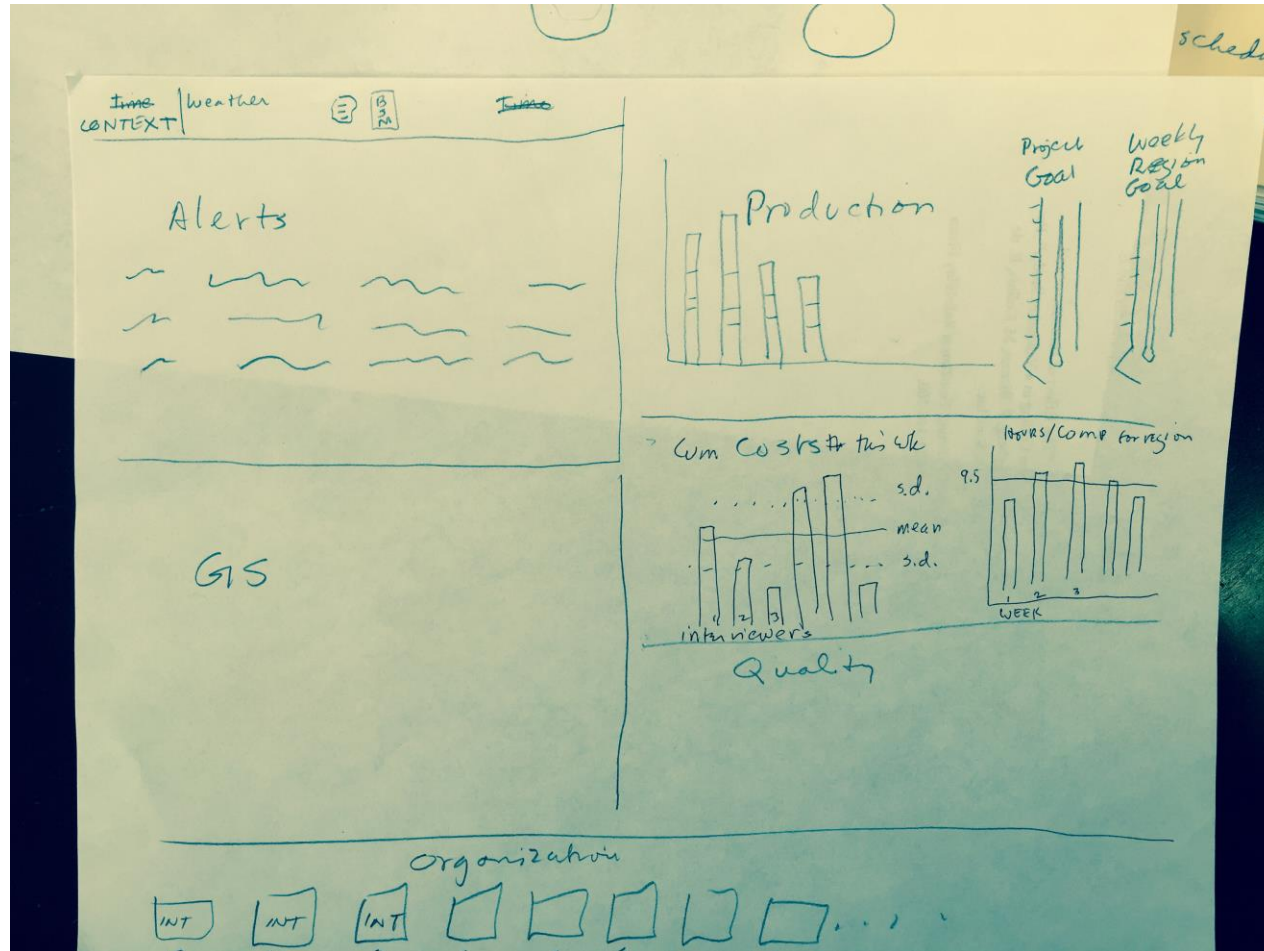
2015 Development Schedule

- January/February
 - Developing common language
 - Agreeing on general approach
 - Defining the user
 - Identifying metrics
- March/April: Parallel tracks
 - Standing up the paradata
 - Creating views into the data, using M3 and dot.net
- May/June: testing, iterating

Pd3 Metrics

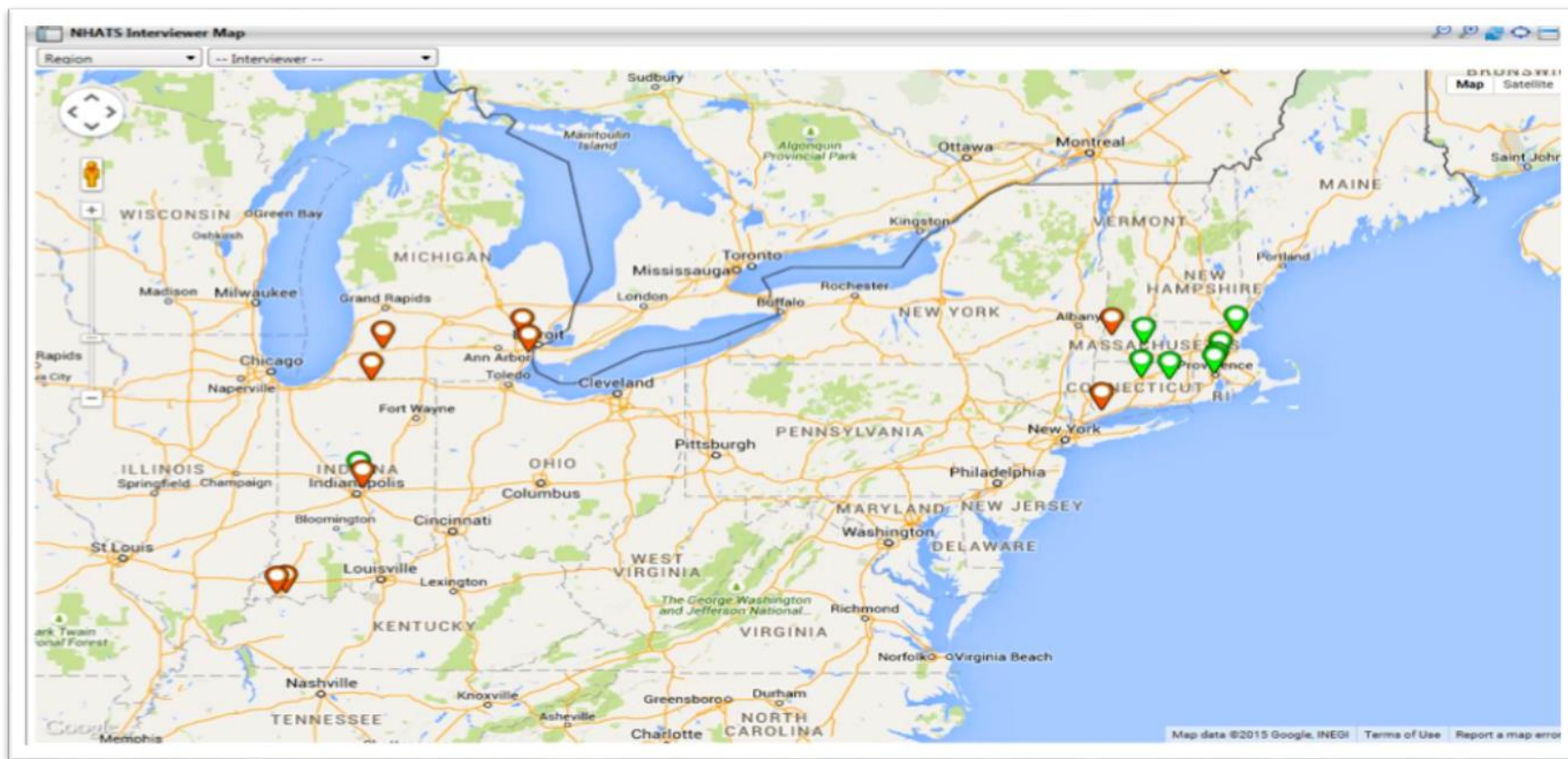
- Interviewer hours per completed interview (HPC)
- Response rates (RR) by sample type
- Completes compared to goals
- By interviewer: Overall quality score for first interview coded compared to next interview coded after feedback
- Interviewer work status, location
- For alerts: Interviews completed at unusual times, or too short, or without consent to audio-record (signaling potential for falsification)

Field Supervisor Dashboard Layout, March '15



Initial Deployment, July '15





Post-Deployment

- July '15: Trained about a dozen field supervisors
- October '15: Debriefed supervisors, began dissemination to other projects, and development of v2
- May '16: Christened “Paradata Discovery Dashboard” (Pd3)
- Branched out in past year to develop web and telephone versions, client versions, short course, get experience into the literature

Rapid Feedback

- Dashboard speeds information flow
- Westat research program has found powerful effects on data quality when interviewers get verbal and written feedback within 72 hours of interview
- Enhanced sense of belonging to a team dedicated to quality improvement
- Virtuous cycle
- Can also act as a deterrent

Managing Quality alongside Production, Cost

Dashboards

- Push responsibility down to the manager for making tradeoffs that include specific quality elements
- Can lead to insights about tradeoffs because data quality metrics are displayed alongside production and cost metrics
- Can highlight various dimensions of quality, and give them more prominence for the manager
- Can be an important tool for reducing total survey error

Case Study: US PIAAC Dashboards

PIAAC

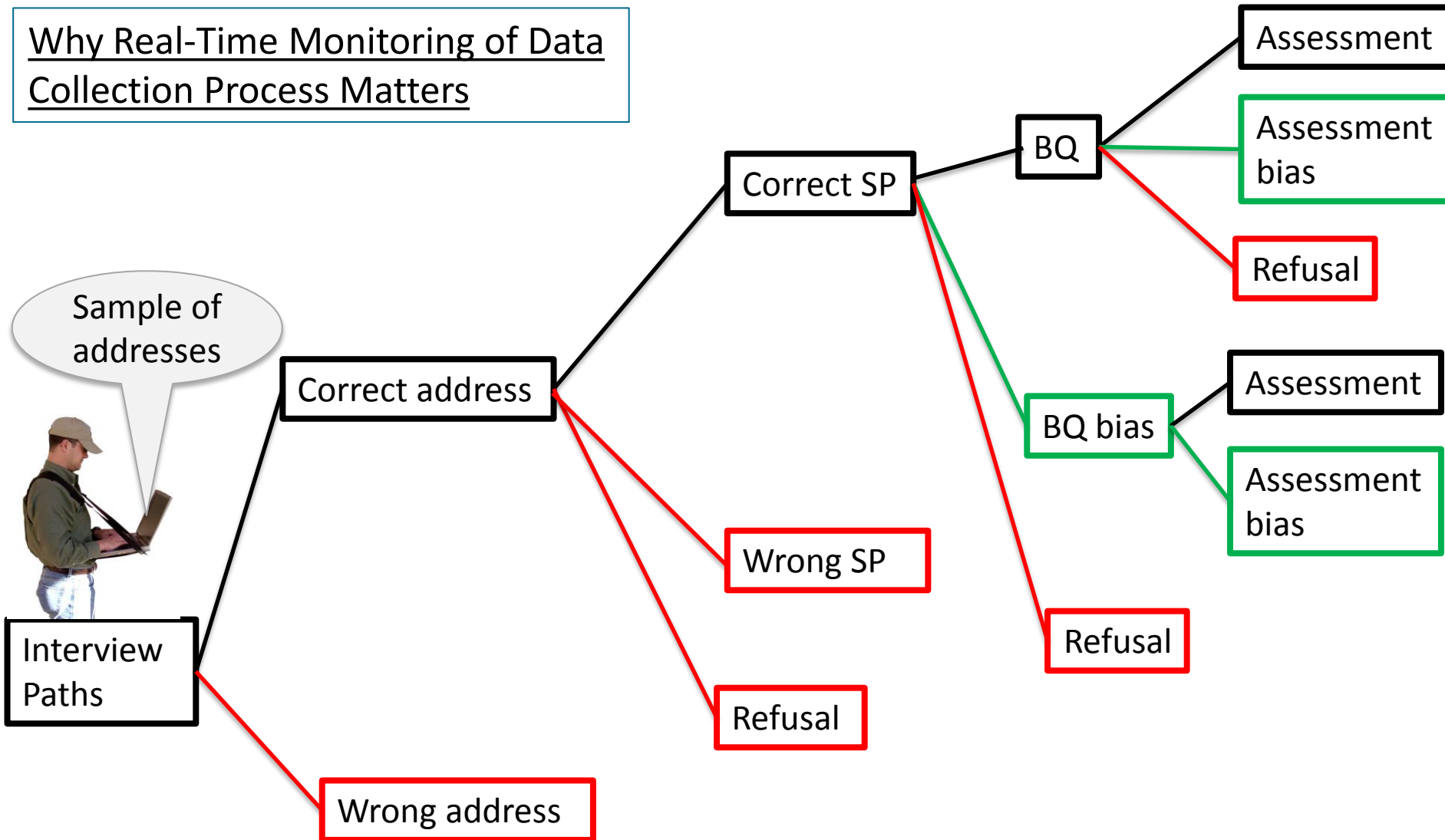
A Multi-Cycle International Programme

- Examines a range of basic skills in the information age
- Assesses these adult skills consistently across participating countries
- The first cycle of PIAAC
 - 24 countries participated in 2011–12 (Round 1)
 - 9 countries participated in 2014–15 (Round 2)
 - 5 countries are participating in 2017–18 (Round 3)

US PIAAC

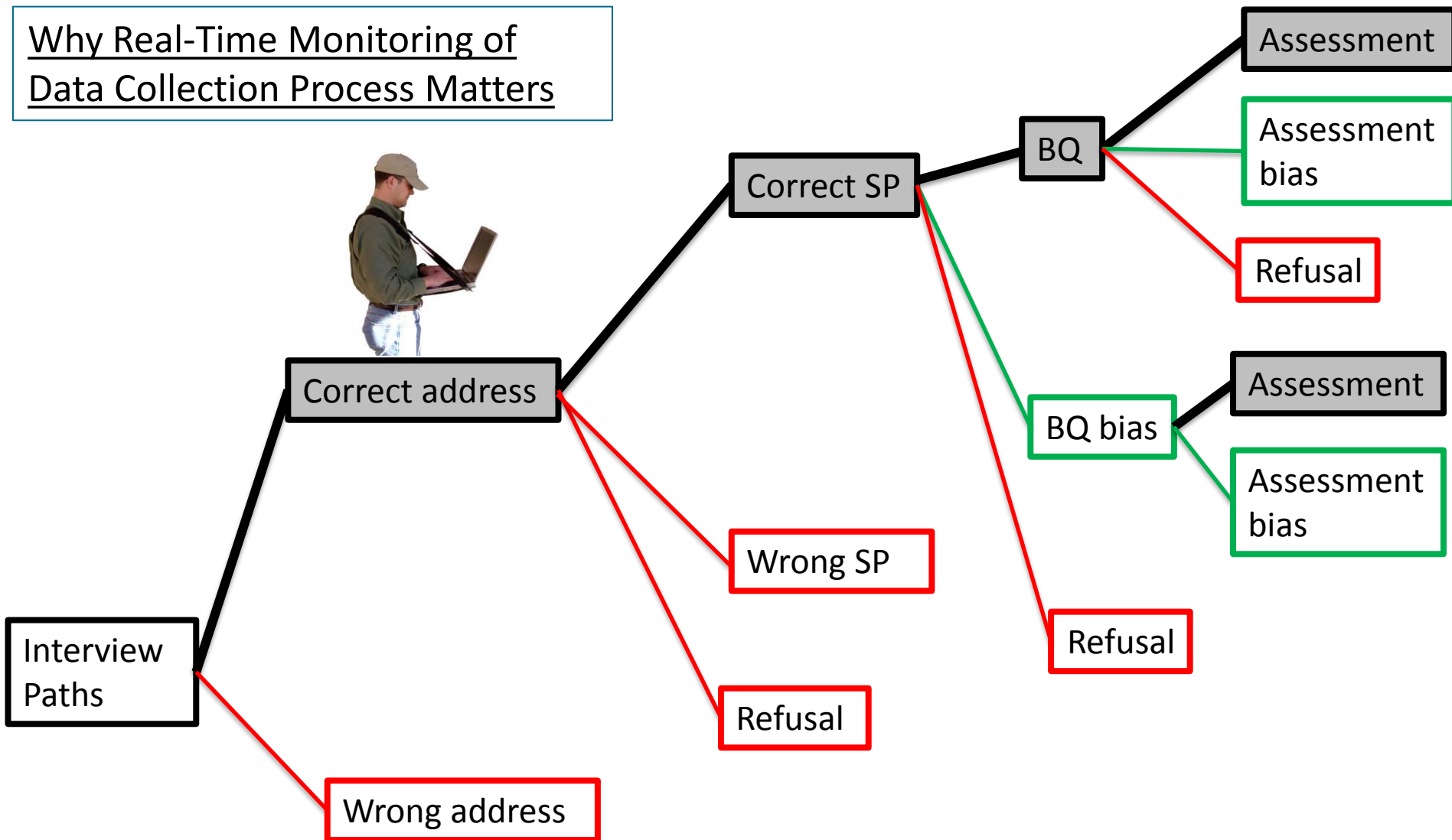
- Participation in all three rounds of the first cycle
 - Round 1 sample size $\approx 5,000$
 - Round 2 sample size $\approx 3,600$
 - Round 3 sample size $\approx 3,800$

Why Real-Time Monitoring of Data Collection Process Matters



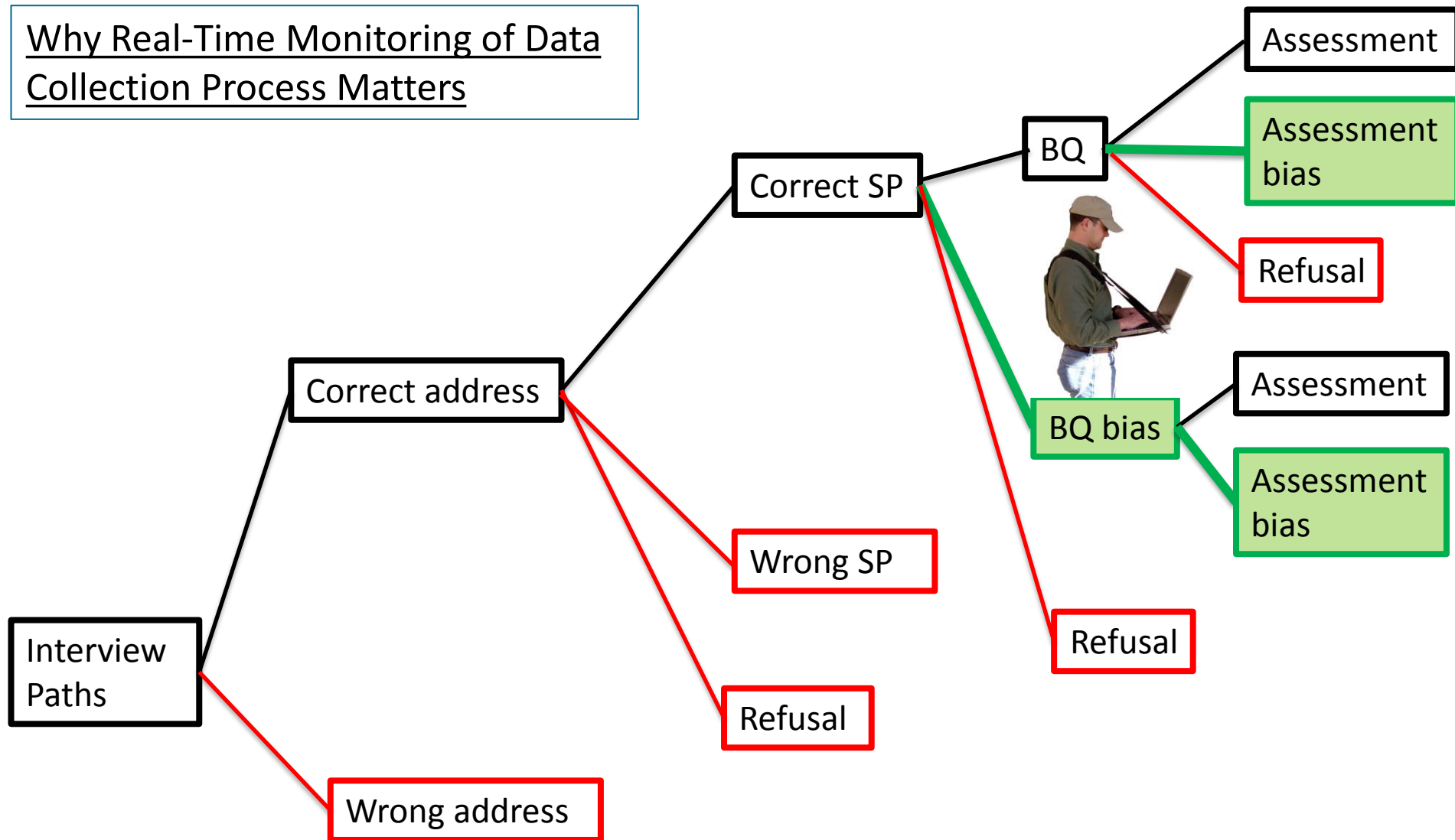
- **Sample data**
- **Contaminated data - Interviewer influence**
- **No data – Falsified data**

Why Real-Time Monitoring of Data Collection Process Matters



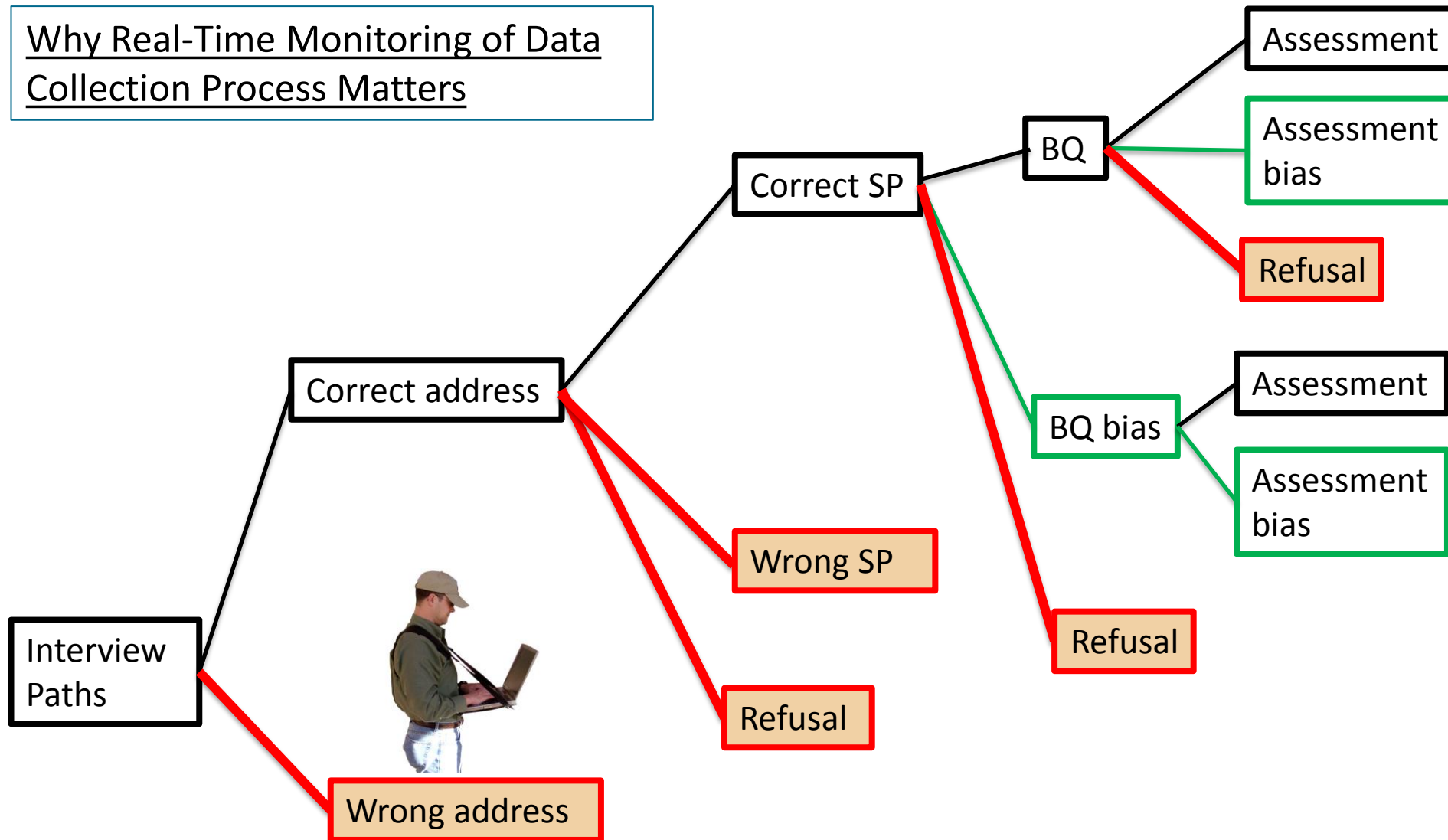
- ☐ Sample data
- ☐ Contaminated data - Interviewer influence
- ☐ No data – Falsified data

Why Real-Time Monitoring of Data Collection Process Matters



- ☐ Sample data
- ☐ Contaminated data - Interviewer influence
- ☐ No data – Falsified data

Why Real-Time Monitoring of Data Collection Process Matters



- Sample data
- Contaminated data - Interviewer influence
- No data – Falsified data

Data Collection QC

US PIAAC Round 1 and Round 2

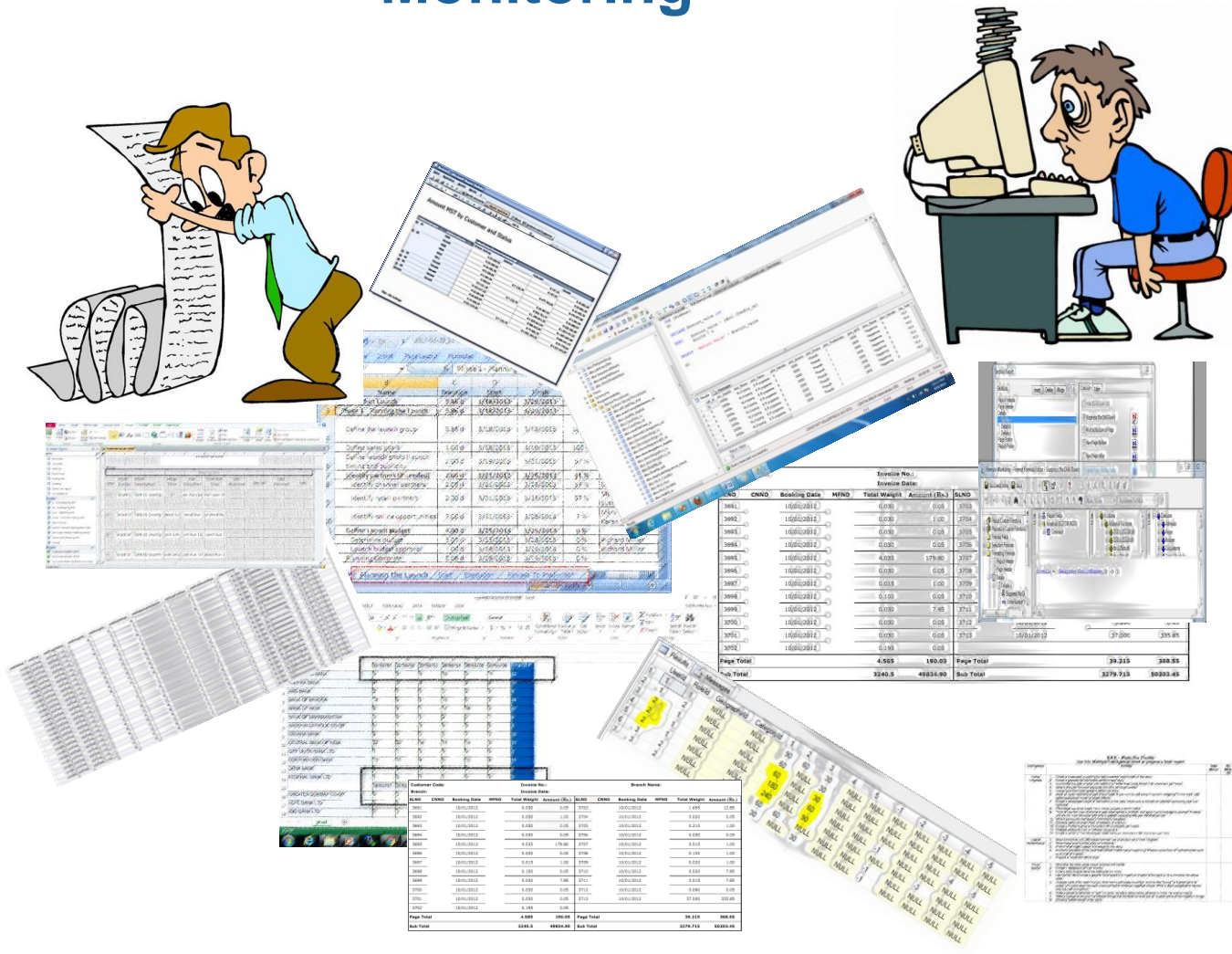
- Web-based interactive Case Management System (CMS) to
 - Manage case information
 - Record disposition codes
 - Review interviewer productivity
 - Monitor overall production
- Data collection monitored through manual inspection of a large number of reports

Data Collection QC

US PIAAC Round 1 and Round 2 (2)

- Reports followed PIAAC Standards and Guidelines on falsification detection and other QC
 - Each instrument duration
 - Time between interviews
 - Interviews conducted very late/very early
 - Number of interviews per day
 - Monitoring data quality
 - Interviewer productivity (highest producing interviewers)
 - Validation
 - Observations/audio recording
 - ...

US PIAAC Round 1&2 QC Monitoring



Data Collection QC

US PIAAC Round 3

Switched to managing and monitoring the progress of data collection in the field using Westat's new system

- Mobile phones
- GPS tracking system
- Dashboard

Exception

- CARI (Computer Audio-Recorded Interviewing) not used because the VM does not have the capability to capture voice data
- Timing only monitored at the instrument level
 - Item timing is not accessible during data collection

Application of Mobile Phones in US PIAAC

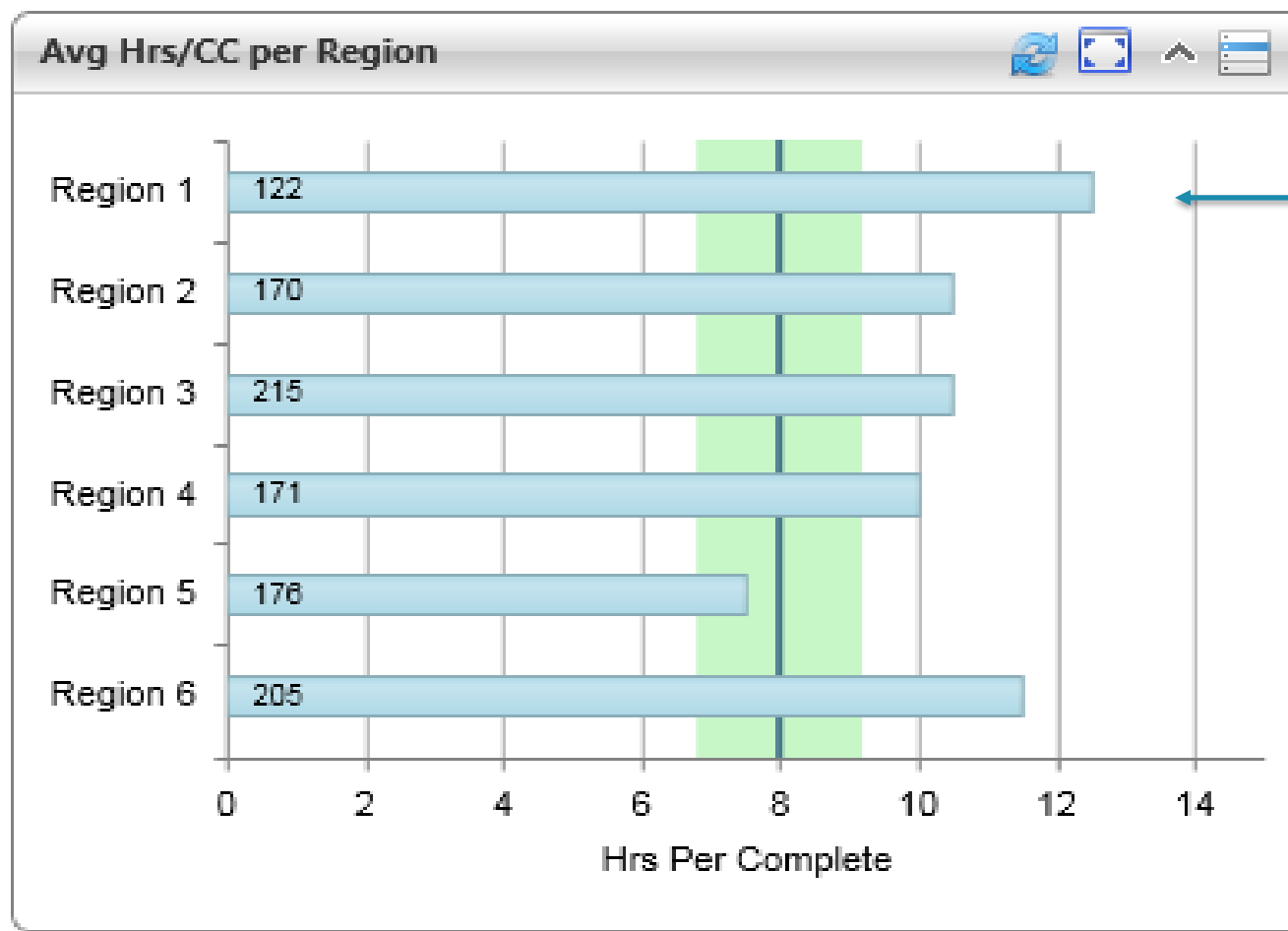
- **iPhone used to increase efficiency**
 - Record field work and travel time
 - Enter record of contacts
 - Allow GPS tracking

US PIAAC Dashboards

- Regional and home office manager dashboard
 - Seven portlets
 - Interviewer window
- Field supervisor dashboard
 - Seven portlets
 - Only showing the supervisor's region
 - Except productivity portlet shown for all regions
 - Interviewer window

PIAAC Dashboard Portlets - Example

Hours Per Complete By Region



Region 1



Data Collection Monitoring in Round 3 – Results

- Significant time and cost savings for field supervisors, regional directors and home office management to
 - Review status
 - Review productivity
 - Identify falsifiers
- Automated alerts
 - Enables rapid response to crisis in the field (reduces burden and costs)
 - Enables real-time monitoring of falsifiers
 - Reduces the burden of re-fielding falsified cases

Future Directions

2nd Cycle of PIAAC and Beyond:

Establishing an automated process that further minimizes interviewer error and falsification

- US PIAAC experience shows a significant improvement in data quality, at reduced monitoring costs, using:
 - Mobile phones
 - GPS tracking system
 - Data collection dashboard

2nd Cycle of PIAAC and Beyond:

Establishing an automated process that further minimizes interviewer error and falsification (2)

- Other Westat experiences show CARI to be a critical source for improving data quality and validation
- Monitoring item-completion time also an important tool for identifying interviewer effects and falsifiers

CARI and Time Data – Critical Monitoring Tools for QC of Assessments

■ CARI

- Unobtrusive (unlike tape recording)
- Applies to 100% of cases
- Great value for observing interviewing flaws
- Great value for detecting falsification
- Tag recording to match specific items in an instrument

■ Time data

- Additional portlets can be created to show item-completion time data patterns and outliers, using statistical regression models
- Alert portlets can send alerts to supervisors in a real-time basis

2nd Cycle of PIAAC and Beyond: Data Monitoring Process – Data Requirements

- *An automated process requires*
 - *Case Management System*
- *An ideal automated process requires real-time access to*
 - *Voice Data - CARI*
 - *Time data*
- *An ideal system will include*
 - *GPS tracking system – mobile app*
 - *Dashboard*

Summary and Conclusions

Summary and Conclusions

- Performance dashboards
 - A visual display of the most important information on a single screen
 - Provides a real-time monitoring of the progress of data collection and signals unusual outcomes
- Evolution of performance dashboards at Westat
- Application of dashboards during US PIAAC Round 3 data collection
 - Significant monitoring time and cost savings
- Sample monitoring in Future Cycles – A Wish List
 - Case Management System
 - Voice and time data
 - GPS tracking and dashboards

Thank You

leylamohadjjer@westat.com