Increasing Blood Collection During Home Interviews: Dried Blood Spots and Plasma for Multiplex Assays

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- Population-based, community-resident sample with minority oversampling
  - Wave 1 (2005-2006): 3,005 older adults ages 57-85
  - Wave 2 (2010-2011): 3,377 adults, including 2,322 Wave 1 respondents ages 62-90 and a subsample of their co-resident romantic partners, 955 adults ages 36-99

- Multi-mode data collection
  - 120-minute in-home interview, including the in-person questionnaire and biomeasure data collection
  - Leave-behind pencil-and-paper questionnaire
  - 3-day actigraphy sub-study (Wave 2 only)

Wave 1: Dried Blood Spots
- HbA1c Diabetes
- Total Hemoglobin Frailty
- EBV antibody Immune surveillance
- C-reactive Protein Inflammation;
  - Cardiovascular Disease

Wave 2: Expanded DBS and Plasma
- Multiple pro and antiinflammatory cytokine profile
- CVD specific marker: chemokine MCP-1
- Lipidomics and Cardiovascular Disease
  • Cholesterol, HDL
  • Adiponectin
  • ApoB
  • Fibrinogen

Improved Blood Collection Technique To Increase Yield

1 drop = 0.05 ml
("discard" blood spot = 0.05 ml)
Field Interviewer Protocol in the Home

Handwarmer: Activate 10 min (before cognition test)
Hold for 10 minutes (during olfaction test)

Lancet

Blood Spot Card
5 Drop target

Flo Top EDTA coated microtainer
250 ul target

Dried, Refrigerated, Shipped Weekly

Blood Drop Equivalents

1 drop = 0.05 ml
(‘throw away’ blood spot = 0.05 ml)

Dried Blood Spot Card

5 drops = Full Card with 5 Blood Spots

Partial = 250 uL = .25 ml = 5 drops
Complete = 500 uL = .50 ml = 10 drops

Collection Goals

5 drops = Full Card
10 drops = Full Card and Partial Microtainer
15 drops = Full Card and Complete Microtainer

Partial Cards
Full Card Plus 250 uL Microtainer Whole Blood

Hoffmann, You, Kern

W2 vs W1: Hand Warming, New Lancet, and Streamlined Protocol

2.3 Fold Increase In The Number of Blood Drops Per Prick

Wave 1               Pretest Wave 2
3.83 ± 0.03         8.79 ± 0.40
P < 0.00001

129% increase

One Prick Yielded Enough for:
A Full Blood Spot Card and
150 ul Microtainer

Hoffman, You, Kern

W2 vs W1: Hand Warming, New Lancet, and Streamlined Protocol

2.5 Fold Increase In Total Number of Blood Drops

Wave 1               Pretest Wave 2
4.50 ± 0.02         11.87 ± 0.33
P ≤ 0.00001

164% increase

Partial Cards
Full Card Plus 250 uL Microtainer Whole Blood

Hoffmann, You, Kern
Total Duration of Blood Collection

- Introduction and permission
- Set up
- 1 blood drop--Throw away blood spot (.05 ml)
- 5 blood drops--blood spot filter paper (.25 ml)
- 5 blood drops--partial microtainer (.25 ml Pretest only)
- 5 blood drops--complete microtainer (.25 ml; Pretest only)
- Pack up

Minutes per blood drop collected

<table>
<thead>
<tr>
<th>Wave 1</th>
<th>Median Duration (minutes)</th>
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<tbody>
<tr>
<td>Pretest</td>
<td>1.33</td>
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<table>
<thead>
<tr>
<th>Wave 2</th>
<th>Median Duration (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>1.01</td>
</tr>
</tbody>
</table>

Summary of Pretest Wave 2

- 33% shorter duration
- 8.8 drops from one prick (up from 3.8 drops)
- 11.9 blood drops collected (up from 4.5 drops)

Field Interviewers Had Big Consistent Differences in Speed of Blood Collection

Three Types: Fast, Intermediate and Slow

P ≤ 0.000001

Are there three distinct types of field interviewers?

Fast DBS Field Interviewers Are Similar

Kaplan-Meier Censor Survival Plot for Blood Collection Duration in Minutes

Censor Variable: Home

Grouping Variables: Blood Collected Speed

Inclusion criteria: Six or More Samples (and F1091982) from BloodDurations.csv

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Censor Variable: Home

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Hoffmann, You, Kern
Are there three distinct types of field interviewers?
Intermediate DBS Field Interviewers Are Similar
Slow DBS Field Interviewers Are Similar

Microtainer

Luminex Multiplex Assay System

Inflammation
C-reactive protein

Cardiovascular Disease
Subclinical Chronic Inflammation

Monocyte Chemotactic Protein-1
Also termed Chemokine (C-C motif) ligand 2 (CCL2) or small inducible cytokine A2
- Plaque Destabilization
  - smooth muscle and endothelial cell migration
  - oxidative stress
  - neovascularization
- Thrombosis

Access to the Data

- Data publicly available under a Restricted Data Use Agreement through the National Archive of Computerized Data on Aging (NACDA), located within ICPSR at the University of Michigan
- Data users must submit:
  1. The completed data use agreement with original signature(s)
  2. A copy of your IRB approval from your current institution
  3. A data protection plan, which is a written description of how the data will be stored at your site and how the data will be protected from unauthorized access on your institution’s computer network

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C-reactive protein

MCP-1
Cardiovascular Disease Specific Biomeasure

Monocyte Chemotactic Protein-1
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