

# Dietary Supplement Label Imaging in the National Health and Nutrition Examination Survey

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National Center for Health Statistics  
Division of Health and Nutrition Examination Surveys



# Presentation Outline

- ❑ Overview of NHANES
- ❑ Overview of dietary supplements data collection in NHANES
- ❑ Exploring the use of digital imaging technology for dietary supplements data collection
- ❑ Proof-of-concept study

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## NHANES Overview

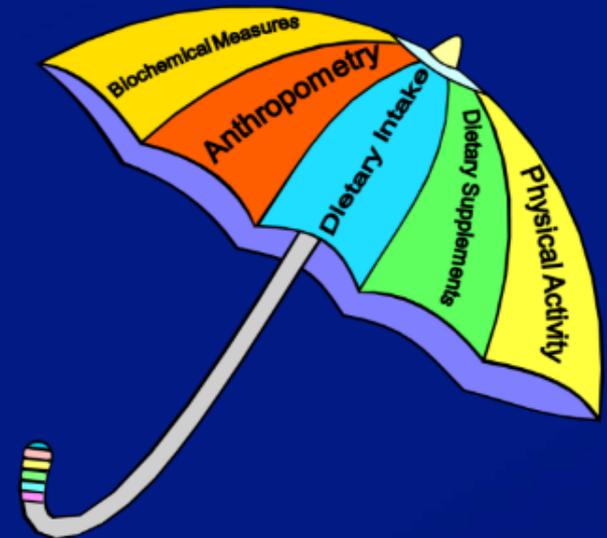
- ❑ Cross-sectional survey of the civilian, non-institutionalized population
- ❑ Assess the health and nutritional status of adults and children in the U.S.
- ❑ A nationally representative sample of about 5,000 individuals a year
- ❑ Household interview and a physical examination

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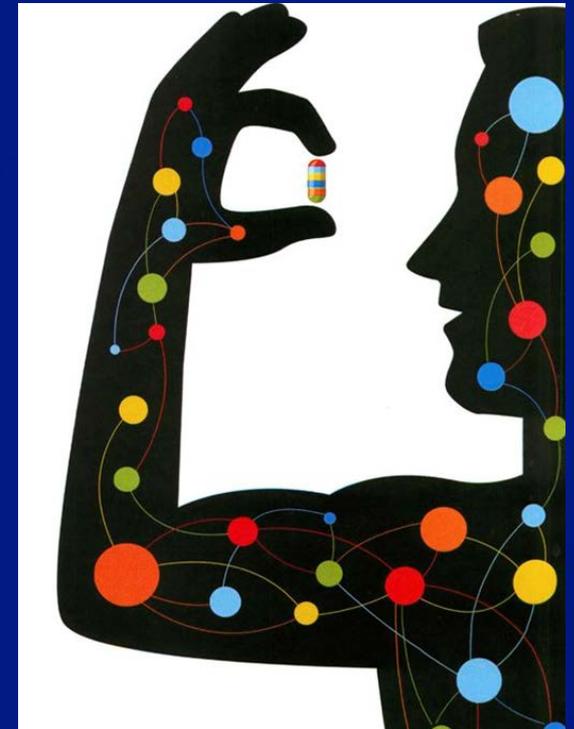
# Why Do We Collect Dietary Supplement Data?

- Dietary supplement data used to:
  - Characterize usage
  - Estimate nutrient intake
  - Assess the percentage of the population meeting or exceeding dietary recommended intakes for specific nutrients
  - Help guide research needs and resources



# What is a Dietary Supplement?

- ❑ A product that:
  - is intended to supplement the diet
  - contains one or more dietary ingredients:
    - Macronutrients
    - Vitamins, Minerals, Amino Acids
    - Herbs or other botanicals
    - “Other” dietary substances
  - is intended to be taken by mouth



## Who are the Stakeholders?

- ❑ National Institutes of Health, Office of Dietary Supplements (Collaborator)
- ❑ United States Department of Agriculture, Nutrient Data Laboratory and Food Survey Research Groups
- ❑ Researchers

# How is this Data Collected?

## □ Participants' are asked:

- If they have used or taken any vitamins, minerals, herbals or other dietary supplements in the past 30 days?
- Includes prescription and non-prescription supplements
- To show supplement containers (seen ~86% of time)



# What Information is Collected by the Interviewer?



- ✓ Complete name from the front of the container
- ✓ Form of the product (e.g. tablet)
- ✓ Manufacturer/distributor name and address



# *Currently.* Labels Obtained from Manufacturers

During the Household Interview

Product name collected  
manufacturer name collected



After the Household Interview

NCHS staff contact manufacturers and ask for the "Supplement Label"



Estimate nutrient intake from supplements per respondent

# Currently: Labels Obtained from Manufacturers

During the Household Interview

Product name collected  
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After the Household Interview

NCHS staff contact manufacturers and ask for the "Supplement Label"



Estimate nutrient intake from supplements per respondent



Timeliness and level of effort: 2 Years  
Accuracy: 1 out of 5 "seen" containers do not have a "exact match"

# Words matter!



Ultra Women's, Ultra Men's, Silver, for Adults 50+

## **This Project's Objectives**

- ❑ **Adapt a more efficient process to collect the information**
  - Reduce effort to obtain product labels
  - Increase timeliness of data release
- ❑ **Improve data quality by increasing accuracy**

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# Capturing Supplement Label Images

## □ Challenges

- Most labels are cylindrical – cannot be imaged in focus with conventional cameras
- Some labels are oversized
- Inadequate lighting, background clutter, uneven framing
- Interviewers are not trained in photography

# Capturing Supplement Label Images

## □ Early Effort – conventional camera

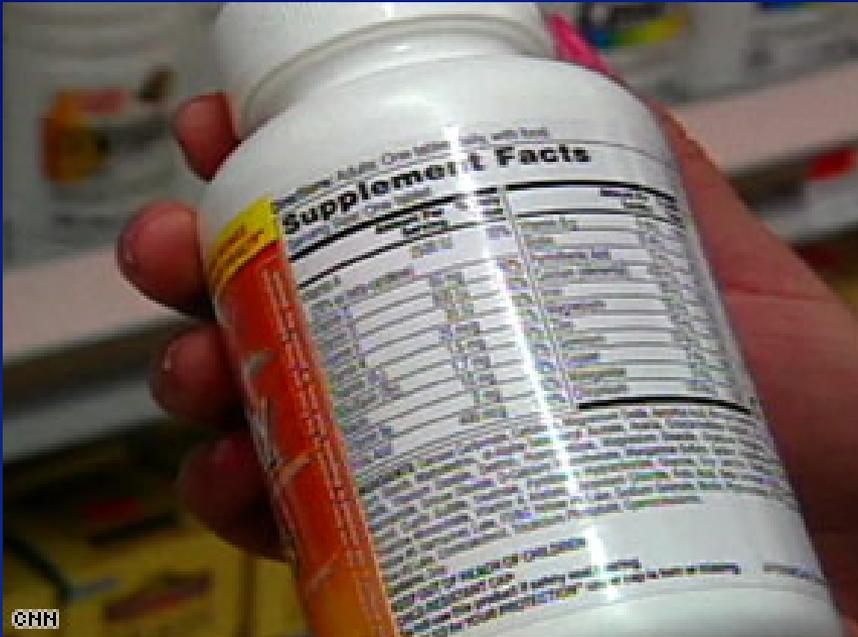
- Newer cameras offering actual or “stitched” panoramic images were considered
- Actual panorama deemed too unpredictable – not practical for users to hold/rotate a container while making an exposure

## □ Results

- Stitched panorama mode was tried but did not yield readable images
- Text could not be aligned between images

# Conventional Camera

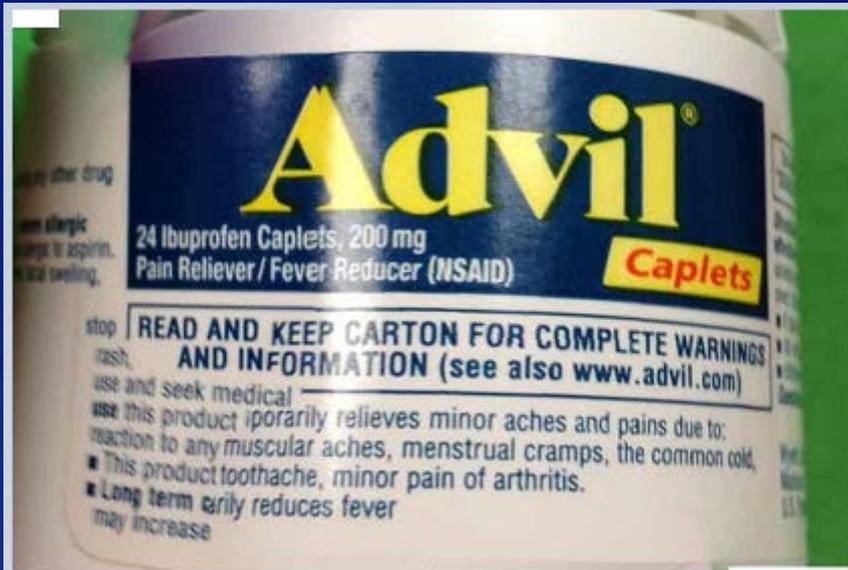
- Soft focus
- Poor lighting
- Poor framing
- Busy background



# Capturing Supplement Label Images

- ❑ **Early Effort – conventional camera with post-editing**
  - Photoshop allows for more precise image stitching
  - User makes several (usually 4) images, one of each side
  - Images are submitted to stitching algorithm in the software
  
- ❑ **Results**
  - Software stitching algorithm did not yield readable images
  - Text could not be aligned between images
  - Frequently the software rejected the images as not matchable

# Conventional Camera with Post-Editing



Soft focus  
Poor lighting  
Poor framing  
Busy background  
... and worst of all  
Text Mismatch

# Meditory RxLabelReader



# Capturing Supplement Label Images

## □ Meditory RXLabelReader -- Pros

- Line scanner with self-contained lighting and rotating platform
- Captures images of cylindrical images as if unrolled and flattened
- Consistent framing, focus, lighting, with clean background
- Optional Optical Character Recognition (OCR)
- Optional image segmentation and field sorting

# Capturing Supplement Label Images

## ❑ Meditory RXLabelReader -- Cons

- Size, weight, setup time, capture time, user training
- Does not accommodate oversized or non-cylindrical containers
- Integration with proprietary software
- Requires battery to operate, battery life untested
- Start-up company, prototype units, difficult to obtain units for testing and integration, questions about future support
- Not for sale, leasable only

# Capturing Supplement Label Images

## ❑ Meditory RXLabelReader – Other considerations

- An early prototype was delivered for testing and performed image capture functions as described
- Efforts were made to obtain APIs to integrate the device but due to delays in production, and device upgrades and redesigns, we were unable to configure a fully functional device for testing
- CMS evaluated the same device and kindly allowed us to observe a demonstration created by their data collection contractors
- Our conclusion is that the device has great potential but may not be ready in reasonable time for our needs

# IPEVO Ziggi-HD Plus



# Capturing Supplement Label Images

## □ IPEVO Ziggi-HD Plus -- Pros

- Flat document scanner with cantilevered arms can take in any size or shape
- Autofocus
- Lightweight, needs no battery (USB powered)
- Simpler software integration
- Far less expensive, bought and owned outright

# Capturing Supplement Label Images

## ❑ IPEVO Ziggi-HD Plus – Cons

- A flat “unrolled” image cannot be obtained
- “Stitching” ruled out based on earlier testing
- Consistent framing, lighting, and clean background only possible if a strict user protocol is followed, requiring user training
- Simpler software means future enhancements such as segmentation, OCR, or field sorting would require additional software or logic

# Capturing Supplement Label Images

## □ IPEVO Ziggi-HD Plus – Other considerations

- Mature technology, test units have been delivered and perform as expected, software performs as expected
- Established vendor, no issues expected with delivery of camera units in any quantity
- Compromise over the RXLabelReader is that finished product will consist of four separate images per label, instead of one flat “unrolled” label
- High quality of the images produced allows all relevant information to be read

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# Proof-of-Concept Study: IPEVO Ziggi-HD Plus

- ❑ Objective: Can this device be pilot tested in NHANES?
- ❑ Goals of the study:
  - Assess the feasibility of integrating the IPEVO camera with the Blaise survey software
  - Conduct a user test to assess the accuracy of data collected, timing, the protocol for taking pictures, and logistics of use
  - Assess survey design implications (i.e. importing data into the questionnaire)



# User Test

- ❑ 9 interviewers (participants)
  - Range of experience on WESTAT projects
- ❑ Equipment: tablet with test survey (Blaise), camera and dietary supplement bottles
- ❑ Participants will be trained
- ❑ Three separate tests to assess timing and accuracy
  - Order will be randomized (current protocol, camera only, manual entry and camera)
- ❑ Debriefing questionnaire



# Project Timeline

Development  
12/29-2/17

Testing  
2/9-3/1

User Test  
3/23

Data analysis  
3/24-4/16

Pilot test in  
NHANES  
September,  
2016?

# Questions?



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# Two Options

## RxLabelReader (Meditory)



## Ziggi-HD Plus (IPEVO)

