



## Benefits of the INDDDEX24 Dietary Assessment Platform: Shorter Studies, Lower Cost, Higher Accuracy

### Overview

The INDDDEX24 Dietary Assessment Platform (INDDDEX24) was developed by the Tufts University International Dietary Data Expansion (INDDDEX) Project to aid in the collection and use of 24-hour dietary recall (24HR) data in low- and middle-income countries. The goal in designing INDDDEX24 was to encourage increased collection of actionable dietary data for use in policy-making by developing a solution that would reduce the overall cost and time to field surveys, while also improving accuracy.

### Summary of Results

As detailed below, rigorous validation testing of the INDDDEX24 platform has demonstrated meaningful benefits in all key areas of investigation:

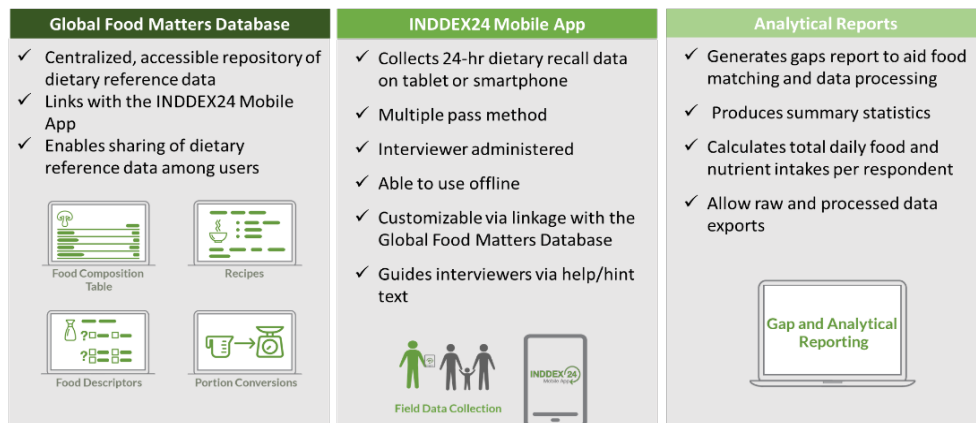
1. Reduced total costs compared to traditional 24HR pen-and-paper data collection methods
2. Further cost savings when dietary reference data already exist in the Global Food Matters Database
3. Equal or lower average time per interview
4. Shorter total time required for the survey cycle from survey preparation through usable results
5. Accuracy and data quality as good as or better than pen-and-paper data collection
6. Improved user experience compared to pen-and-paper data collection

### Background

INDDDEX24 consists of three main components (Figure 1):

- *Global Food Matters Database* – A standardized repository for the dietary reference data (e.g., food composition data, recipes, conversion factors) required for analyzing 24HR
- *INDDDEX24 Mobile App* – A mobile application for dietary data collection
- *Analytical Reports* – Tools for matching food consumption data to food composition information, identifying gaps in the database, and analyzing results

Figure 1. INDDDEX24 Dietary Assessment Platform



## Research Method

To test the accuracy of INDDDEX24, rigorous validation studies were conducted comparing INDDDEX24 to pen-and-paper 24HR, with both evaluated against the benchmark of observer-weighed food records for all respondents. These interviews were carried out for a sample of women between the age of 18 and 49 in both Burkina Faso (n=231) and Viet Nam (n=234). An accompanying cost-effectiveness study in both countries measured the time and cost required to perform a 24HR, the time per interview, and the cost-per-unit of accuracy of INDDDEX24 compared to both pen-and-paper and a benchmark-observer weighed food record. This study used activity-based costing methods to account for the time and money spent to prepare for the study, implement the survey, and process the 24HR data to produce usable results. Cost calculations for using INDDDEX24 accounted for the full cost of all hardware (e.g., tablets) and license fees to access INDDDEX24<sup>1</sup>. To estimate the time per interview, 60 additional respondents were randomly selected from urban and rural areas, and the time of each interview and each pass was recorded.

## Results

Rigorous validation studies concluded that the use of the INDDDEX24 Dietary Assessment Platform reduces the costs and time required to implement 24HR studies while maintaining or improving data accuracy. Specific results across six key areas are detailed below.

### **1. INDDDEX24 is less expensive than pen-and-paper, and cost savings increase with larger surveys**

There are cost savings associated with using INDDDEX24 compared to pen-and-paper 24HR, even after accounting for hardware costs and license fees. We found that using INDDDEX24 reduced the cost by \$65 per respondent in Viet Nam where pen-and-paper cost \$820 and INDDDEX24 cost \$755 per respondent, and by \$5 per respondent in Burkina Faso where pen-and-paper cost \$544 and INDDDEX24 cost \$539. Several scenarios were modeled to estimate cost savings as sample sizes increase (e.g., for national surveys). Cost per respondent further decreases in larger surveys due to economies of scale and efficiency gains. For example, based on modeled results of a national survey of women of reproductive age conducted by locally-based personnel, INDDDEX24 was more cost-efficient per respondent than using pen-and-paper (for INDDDEX24 and pen-and-paper respectively: \$109 vs. \$139 per respondent in Viet Nam and \$123 vs. \$148 in Burkina Faso, representing cost reductions of 21.6% and 16.9%, respectively).

### **2. Cost savings with INDDDEX24 increase further when dietary reference data already exist in the Global Food Matters Database**

Any quantitative dietary consumption survey, such as a 24HR, requires extensive use of detailed dietary reference data such as a food list, food composition data, standard recipes, and conversion factors. Because it can take significant time and effort to assemble the required datasets, users of the INDDDEX24 Dietary Assessment Platform may benefit from even greater cost savings when some or all of the dietary reference data already exist, either in the Global Food Matters Database (FMDB) or elsewhere, and are borrowed for use with INDDDEX24. For example, modeled results show that if an INDDDEX24 user borrows 25-75% of the required dietary reference data from the FMDB, the incremental cost savings associated with using INDDDEX24 compared to pen-and-paper could range from \$136-\$277 USD per respondent in Viet Nam and \$28-\$74 USD per respondent in Burkina Faso.

### **3. Time per interview with INDDDEX24 mobile app is, on average, equal or lower compared to 24HR with pen-and-paper**

For enumerators using INDDDEX24, the interview process is, on average, shorter, allowing for more interviews per day and/or fewer enumerators in the field. In Viet Nam, interviews were about five minutes

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<sup>1</sup> For the cost calculations, we used the fee of \$10,000 per instance of the app; however, the actual cost may be different in future studies.

shorter (39.0 minutes with INDDDEX24 and 44.2 minutes with pen-and-paper), and in Burkina Faso interviews were about three minutes shorter (47.0 minutes with INDDDEX24 and 49.9 minutes with pen-and-paper). At the individual level, there was significant variability in the time per interview due to the range in complexity of diets. These time savings are relevant beyond the total time and cost savings mentioned above, as it also translates to reduced time burden and survey fatigue for the respondent.

#### **4. Time required from start to finish of the survey cycle is shorter with INDDDEX24**

There are three other areas where users benefit from significant time savings with the INDDDEX24 Dietary Assessment Platform compared to using pen-and-paper. These include the time required to:

- Prepare the dietary reference data in the Global Food Matters Database;
- Set up the INDDDEX24 mobile app, train enumerators, and collect the data; and
- Assemble, analyze and report basic survey findings.

Of these, the largest area of time savings with INDDDEX24 is the elimination of (double) data entry and intensive data cleaning, which is required with the pen-and-paper forms and often subject to error. In addition, the INDDDEX24 Dietary Assessment Platform provides useful tools in the form of standardized analytical reports that can expedite data processing and generate preliminary analyses. The analytical reports can be used as a starting point for deeper analysis to inform policies and programs. Taken together, the time savings introduced through the use of INDDDEX24 can result in shorter survey cycles, thus optimizing funding and use of the results for timely and actionable food and nutrition policy.

#### **5. INDDDEX24 is more accurate and more cost-effective than pen-and-paper**

The accuracy of INDDDEX24 was the same or slightly better than pen-and-paper when compared to the weighed food record, and varied by country, food group, and nutrient. In addition, INDDDEX24 was more cost-effective (i.e., lower cost per unit of relative accuracy) compared to pen-and-paper due to superior accuracy of a composite nutrient intake measure and lower time and personnel costs for survey administration and data entry. INDDDEX24's superior accuracy is likely due to fewer data entry errors and more streamlined processing and analysis. Features such as automatic matching of foods and food codes, structured enumerator workflows through the 24HR, and pre-assigned portion size estimation methods are among the INDDDEX24 innovations designed to improve accuracy and cost-effectiveness.

#### **6. Improved user experience with INDDDEX24 compared to pen-and-paper data collection**

Users of INDDDEX24 in Burkina Faso and Viet Nam were consulted during the formative stage of INDDDEX24, as well as during the validation study, to ensure a user-centered design. Cognitive debriefing of respondents reflected an overall positive experience. Following the validation study, feedback from focus group discussions showed that enumerators, supervisors, and in-country experts preferred INDDDEX24 over pen-and-paper 24HR. Reasons stated by users for preferring INDDDEX24 over pen-and-paper included:

- INDDDEX24 was faster overall, and enumerators did not need to look for food codes to match with foods
- INDDDEX24 was more convenient and did not require carrying bulky paper forms, clipboards, and other materials
- INDDDEX24 was easier to navigate and use in a consistent manner due to the instructions and structure of the app
- INDDDEX24 was more straightforward to edit when necessary after the interview compared to pen-and-paper
- INDDDEX24 provided an energy (kcal) check at the end of the recall, which was helpful in identifying any major issues with the recall in order to correct them with the respondent
- The standard recipes in INDDDEX24 show recipe name and relevant ingredients, ensuring an accurate match with food consumed

## Conclusion

Using the INDDEx24 Dietary Assessment Platform has been shown to result in more accurate dietary data, which is collected in a shorter time and at a lower cost compared to traditional pen-and-paper 24HR. If you are planning to collect individual-level, quantitative dietary data for a large national survey, a small research study, or anything in between consider using the INDDEx24 Dietary Assessment Platform.

### Learn more about the work of the INDDEx Project and the INDDEx24 Dietary Assessment Platform

The INDDEx Project: <https://inddex.nutrition.tufts.edu/international-dietary-data-expansion-project>

The INDDEx24 Dietary Assessment Platform: <https://inddex.nutrition.tufts.edu/integrated-solutions>

Demo videos of INDDEx24: <https://inddex.nutrition.tufts.edu/inddex24-dietary-assessment-platform-resources>

Coates et al., 2017. Overcoming Dietary Assessment Challenges in Low-Income Countries: Technological Solutions Proposed by the International Dietary Data Expansion (INDDEx) Project. *Nutrients*, March 2017. <https://doi.org/10.3390/nu9030289>

Wafa et al., 2018. Methods and Design of Cost and Cost-Effectiveness Study to Compare Different Modalities for Collecting Individual-Level 24-Hour Dietary Recalls in Burkina Faso and Viet Nam. *Current Developments in Nutrition*, June 2020. [https://doi.org/10.1093/cdn/nzaa056\\_011](https://doi.org/10.1093/cdn/nzaa056_011).

*Peer-reviewed journal articles on the cost, cost-effectiveness, and accuracy of INDDEx24 in Burkina Faso and Viet Nam under review ~ Check our website and follow us on Twitter (@INDDExProject) for updates!*

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