Fit for Purpose: An Enhanced Quality Perspective for the National Internet Flu Survey

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1. Definition of Fit for Purpose (FfP)

- Given the limitations of traditional survey designs, assessment of alternative designs calls for an understanding of data quality as a multidimensional concept that addresses the fitness of the data for its intended purpose.[1]
- Efforts have been made to define a 'fit for purpose' framework to supplement traditional statistical quality measurements (e.g., response rates).[2,3,4]
- The Centers for Disease Control and Prevention (CDC) in collaboration with RTI International and GfK Custom Research LLC (GfK) used the 'fit for purpose' paradigm to implement the **National Internet Flu Survey** (NIFS)[5] to capture policy-relevant, time-sensitive early season population estimates.
- This research will examine NIFS based upon the following six 'fit for purpose' criteria:

1. **Relevance**—Data are pertinent to the needs at hand.
2. **Timeliness**—Data are available in the time required (**KEY EMPHASIS**).
3. **Accessibility**—Members of the target population and their responses are obtainable.
4. **Interpretability**—Data and the resulting estimates are understandable and applicable.
5. **Accuracy**—Data are used to correctly measure target population.
6. **Coherence**—Data and the resulting estimates are consistent with external sources.

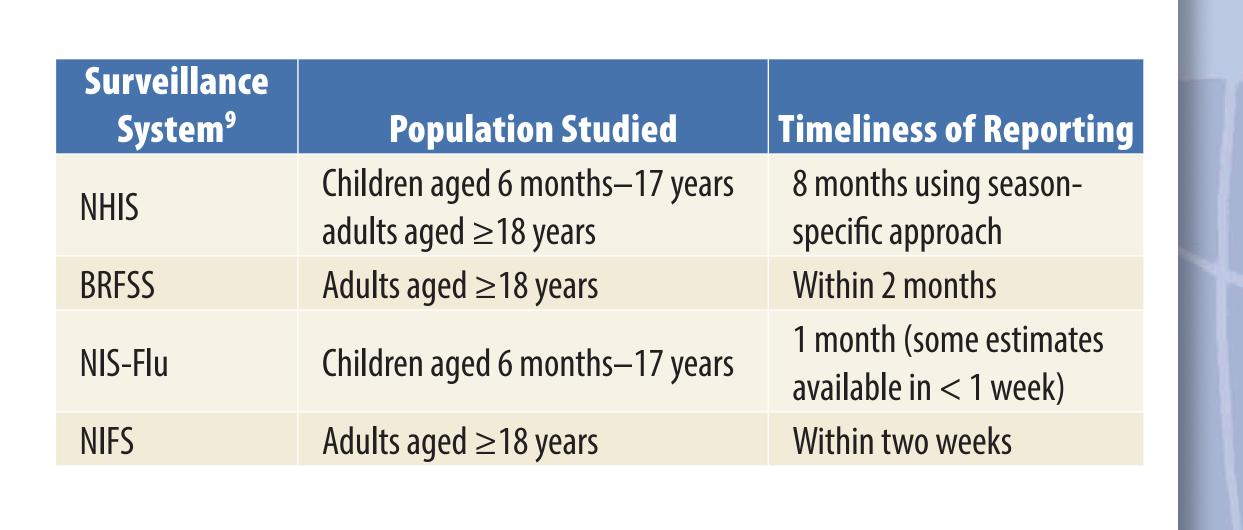## 2. FfP Criterion 1 of 6—Relevance

The CDC Challenge

- A yearly flu vaccination is recommended for everyone 6 months of age and older.[6]
- Large-scale surveys (e.g., National Health Interview Survey [NHIS][7], Behavioral Risk Factor Surveillance System [BRFSS][8]) do not provide early season vaccination rates for adults nor results for smaller, high-risk subgroups for a targeted educational communication.

The CDC Solution = NIFS

- Designed to estimate early season influenza vaccination coverage rates and knowledge, attitudes, behaviors, and barriers (KABB) related to influenza and influenza vaccination in the U.S. adult population
- Provides vaccination coverage estimates of adults by
  - Age group.
  - Race/ethnicity group.
  - Groups at high risk of serious flu complications, including those with certain chronic health conditions like asthma, diabetes, or heart/lung.[6]

3. FfP Criterion 2 of 6—Timeliness (KEY EMPHASIS)

- NIFS fills a gap in providing early season vaccination estimates for the U.S. adult population needed to plan outreach and education communication strategy for the public to increase the coverage of influenza vaccination programs.
- NIFS 2014 data collected over a two-week period, from October 29–November 12, 2014, using a 5-10 minute questionnaire.
- Estimates used as part of National Influenza Vaccination Week (NIVW), December 7–13, 2014.[6]
  - NIVW established in 2005 to address decrease in vaccinations after the end of November.
  - Activities typically include press conferences, Twitter chats, community outreach events, and more.

Surveillance System[9]	Population Studied	Timeliness of Reporting
NHIS	Children aged 6 months–17 years adults aged ≥18 years	8 months using season-specific approach
BRFSS	Adults aged ≥18 years	Within 2 months
NIS-Flu	Children aged 6 months–17 years	1 month (some estimates available in < 1 week)
NIFS	Adults aged ≥18 years	Within two weeks

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4. FfP Criterion 3 of 6—Accessibility

- Target population = non-institutionalized civilian U.S. adults aged 18 years and older in the United States who speak English.
- Sampling frame = GfK's KnowledgePanel®, a probability-based sample from the target population.[10]
- Sampling design = single-stage stratified sample with some oversampling of targeted subgroups.
- Data collection = NIFS data collection implemented via computer-assisted web interviews (CAWI).
- Obtained a survey weighted Cooperation Rate 2[11] of 53.1% (with Partials = 0).
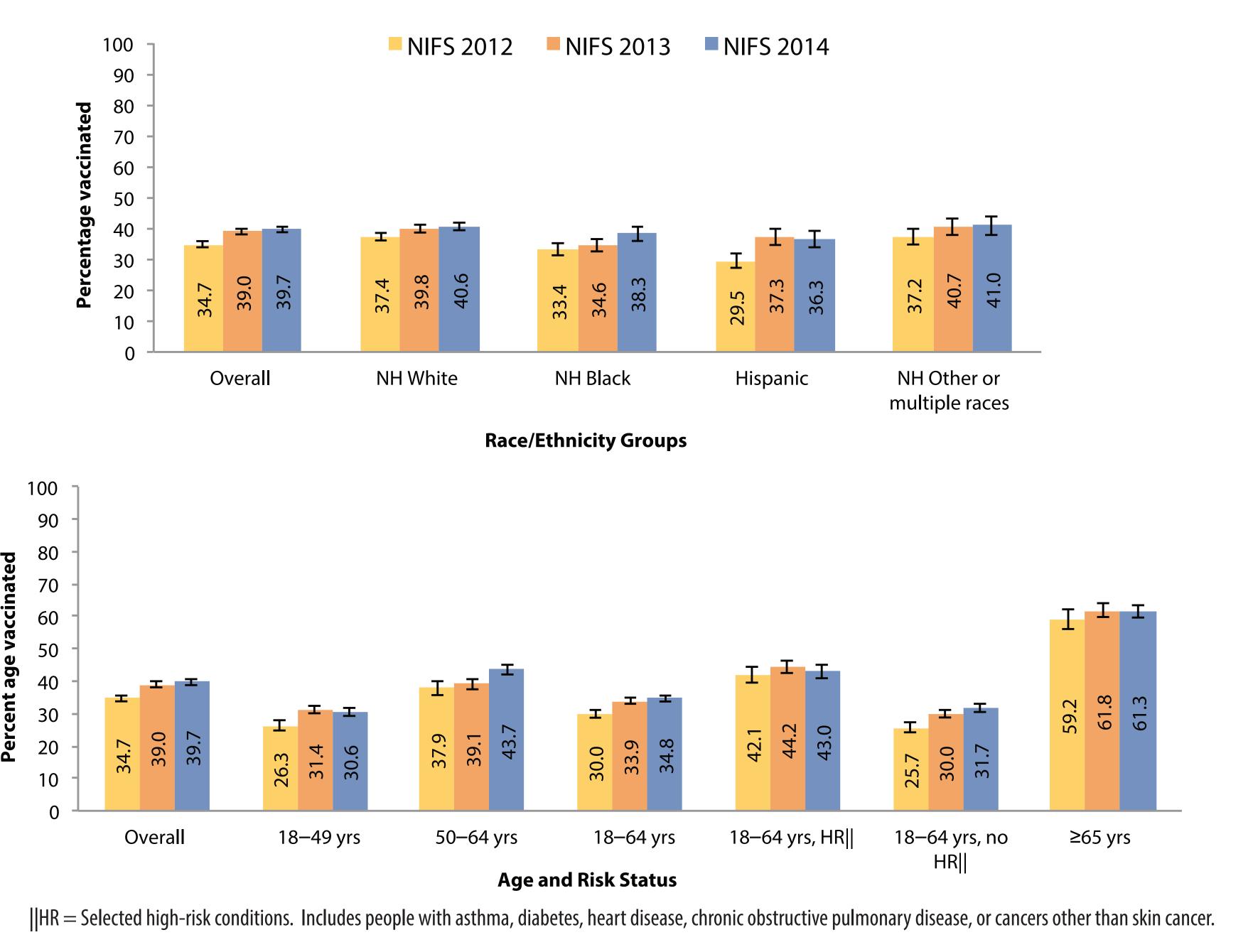
NIFS 2014 Sampling Frame

Age	Race/Ethnicity	Stratum	Percentage of KP	Percentage of Sample Design
18–49	Hispanic	1	7.4%	10.0%
	NH White	2	25.8%	20.0%
	NH Black	3	5.4%	7.7%
	NH Other or multiple races	4	3.6%	8.4%
50–64	Hispanic	5	2.6%	3.5%
	NH White	6	24.8%	19.3%
	NH Black	7	3.5%	5.1%
	NH Other or multiple races	8	1.6%	3.7%
≥65	Hispanic	9	1.0%	1.4%
	NH White	10	22.0%	17.0%
	NH Black	11	1.5%	2.1%
	NH Other or multiple races	12	0.8%	1.9%

NIFS sampling frame excludes Spanish-only speaking adults.
NH = Non-Hispanic

5. FfP Criterion 4 of 6—Interpretability

- NIFS data allow insight into early season vaccination coverage trends overall, as well as across race/ethnicity, age group and risk status to allow for targeted intervention and communication.
- Key findings presented to the public:[12]
  - Fewer than half of adults were vaccinated by early November 2014.
  - Early 2014–15 flu season vaccination coverage similar to early season estimates last year.
  - No racial/ethnic differences for early season flu vaccination coverage in 2014.

|| HR = Selected high-risk conditions. Includes people with asthma, diabetes, heart disease, chronic obstructive pulmonary disease, or cancers other than skin cancer.

6. FfP Criterion 5 of 6—Accuracy

Accuracy is a function of bias and precision.

- **Bias:** All estimates were generated using SUDAAN[13] with weights calibrated to the non-institutionalized civilian U.S. population to address potential coverage bias. Comparison against other surveys under investigation.
- **Precision:** Number of completed interviews was determined to produce estimated vaccination rates with a 95% confidence interval half-width no larger than 5%, assuming a coverage estimate of 40%, in each of the following 9 subgroups:
  - Age (18–49 years; 50–64 years; ≥65 years).
  - Race/ethnicity subgroups (Hispanic; non-Hispanic (NH) white; NH black; NH other races).
  - One or more high-risk health-conditions, adults aged 18–64 (present, not present/unknown).

NFIS 2014 Early Season Flu Vaccination Rate and Relative Standard Errors for Selected Estimates

Category	Estimate of Vaccination Rate	Coefficient of Variation
Overall	39.7%	2%
18–49	30.6%	4%
50–64	43.7%	4%
≥ 65	61.3%	3%
Hispanic	36.3%	7%
NH White	40.6%	3%
NH Black	38.3%	6%
NH Other or multiple races	41.0%	8%
18-64, HR	43.0%	5%
18-64, no HR	31.7%	4%

7. FfP Criterion 6 of 6—Accuracy

Comparative Analyses

- NIFS estimates compared to NHIS and BRFSS to assess external validity (overall, age group, race/ethnicity, year).

Interpretation

- NIFS estimates are greater than those measured by BRFSS and NHIS, particularly for minority race/ethnicity groups.
- Pattern of differences by age consistent for three surveys.
- NIFS estimates show a less pronounced difference in vaccination coverage between race/ethnicity groups.

Possible Explanation

- Methodological differences among the surveys (e.g., differences in sampling frame, CAWI vs. CATI?).
- All surveys show higher vaccination rates than reported released dosages (mode effect?).
- Salience of study for NIFS early season responders (nonresponse bias?).[14]

*Influenza vaccination coverage estimate is based on Kaplan Meier analysis.
†BRFSS estimates for the 2014–15 season do not include data from California. NHIS data for 2014 will not be available until late June 2016.

8. Future Work

- Evaluation of measurement error properties for NIFS.
- Nonresponse bias analysis using panel recruitment and panel maintenance data external to NIFS.
  - Sequential release of cases for better coverage across the short data collection window.
  - Possible inclusion of questions to asses social desirability bias.
  - Statistical adjustment to address possible bias trends in NIFS estimates.
- Comparison of population characteristics and estimates among the different surveys for Internet users.
- Evaluation of sampling design to include additional subgroups.

9. Conclusion

Though improvements are underway, NIFS meets all of the criteria for the CDC's intended fit for purpose.

1. **Relevance**—Study design provides early season flu vaccination coverage estimates for adults.
2. **Timeliness**—Estimates are available to CDC within one week after completion of the two week data collection period (**KEY EMPHASIS**).
3. **Accessibility**—KnowledgePanel® facilitates timely access to target population.
4. **Interpretability**—NIFS estimates can be applied to the needs of researchers, officials and the public.
5. **Accuracy**—Target population and subgroups measured with acceptable levels of precision; bias under review.
6. **Coherence**—Although NIFS estimates were higher than from other surveys, they were consistent with other surveys with respect to trends and differences by age and risk group; however, NIFS estimates of racial/ethnic disparity differed.

References

1. Arnade, C., and M. Gopinath. "The Dynamics of Individuals' Fat Consumption." 1. Biemer, P. P. & Lyberg, L. (2003). Introduction to survey quality, Hoboken, NJ: Wiley.
2. Biemer, P. P. (2010). Total survey error design, implementation, and evaluation. Public Opinion Quarterly, 74(5): 817–848.
3. Baker, R., Brick, J. M., Bates, N. A., Battaglia, M., Couper, M. P., Dever, J. A., et al. (2013), "Summary report of the AAPOR task force on non-probability sampling," Journal of Survey Statistics and Methodology, 1, pp. 90–143.
4. Dever, J. A & Valliant R. (2014) Estimation with Non-probability Surveys and the Question of External Validity. Proceedings of Statistics Canada Symposium 2014.
5. http://www.cdc.gov/flu/fluvaxview/nifs-estimates-nov2014.htm
6. http://www.cdc.gov/flu/protect/keyfacts.htm
7. http://www.cdc.gov/nchs/nhis.htm
8. http://www.cdc.gov/brfss/
9. Centers for Disease Control and Prevention. Surveillance of Influenza Vaccination Coverage — United States, 2007–08 Through 2011–12 Influenza Seasons. MMWR 2013;62(No. SS-4):1-28.
10. http://www.gfk.com/us/Solutions/consumer-panels/Pages/GfK-KnowledgePanel.aspx
11. The American Association for Public Opinion Research. 2015. Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys. 8th edition. AAPOR.
12. http://www.cdc.gov/flu/fluvaxview/nifs-estimates-nov2014.htm
13. Research Triangle Institute (2012). SUDAAN Language Manual, Volumes 1 and 2, Release 11. Research Triangle Park, NC: Research Triangle Institute.
14. Groves, R. M., Singer, E., & Corning, A. (2000). Leverage-saliency theory of survey participation. Public Opinion Quarterly, 64(3), 299-308.

More Information