Standard 8 Re-Evaluation of Staffing Level Model

Pilot Study Report

Subcommittee #2

Program Standards Committee

Conference for Food Protection

October 2019

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Background

Regulatory food safety programs residing within health departments (State and Local) across the country are responsible for conducting food safety inspections for retail food establishments within their respective jurisdictions. These regulatory programs are required to abide by the regulations set forth, at a minimum, by the Food and Drug Administration (FDA) through the FDA Food Code. The FDA, in an effort to achieve uniformity, developed the Voluntary National Retail Food Regulatory Standards (VNRFRPS). The Retail Program Standards allow health departments to enroll and audit the effectiveness of their program. There are a total of 9 standards designed to assist regulatory food safety programs to improve and enhance the services they provide to protect the public.

Issue #2016 II-020

In 2016, an issue (#2016 II-020) was submitted to the Conference for Food Protection (CFP), regarding the ineffectiveness of a model used to determine compliance for Standard 8 (Fig. 1). Standard 8 assesses the regulatory food safety programs' level of *Program Support and Resources*. There are 12 items by which a health department conducts self and verification audits to see if they comply with Standard 8. According to a survey from the National Association of County Health Officials (NACCHO), there is a low percentage of health departments (<10%), that are able to complete Standard 8. Usually the reason for not meeting the standard is due to *Item 8.1: Staffing Level*. This item evaluates if a food safety program has sufficient full-time equivalent (FTE) staff to conduct food inspections. The model calculates if a health department is fully staffed using an inspection-to-FTE ratio. In order to meet Standard 8, the health department must fall into a specific range of 280-320 inspections -per inspector per year. The problems regarding the logic behind the ratio have been explained previously (**see Appendix; Item A: Standard 8 Staffing Level**).

The charges addressed in the first issue #2016 II-020 were evaluated by Conference for Food Protection, 2016-2018 Program Standards Committee, Standard 8 Subcommittee. The goal was to propose a new model, focused on risk-based inspections that would more accurately assess a health department's staffing levels. In 2017, the subcommittee surveyed 390 health departments across the country and collected data on average inspection times and frequencies by risk category. In total, 105 complete responses were received which were used to create a new data-driven model.

Issue #2018 II-018

In 2018, following the work of the Standard 8 Subcommittee, more recommendations were submitted to CFP regarding the initial issue (#2016 II-020). The proposed solutions were accepted by CFP in 2018 and a new issue and subcommittee were created, Issue #2018 II-018 evaluated by Subcommittee #2. The new subcommittee was responsible for addressing the following charges:

> (1) Continue to collaborate with the FDA internal Program Standards working group on modifying the "description of Requirements" for "Staffing Level" in Standard 8 of the VNRFRPS;
>
> (2) Use the supporting attachments listed in the 2016-2918 Program Standards Committee, Standard 8 Subcommittee report as the foundation to establish as more statistically sound logic model for the FTE/Inspection ratio and provide the new calculation/formula to be used by a VNRFRPS enrollee to assess the Standard 8 "Staffing Level";
>
> (3) Propose amendments to Standard 8 of the VNRFRPS and the CFP guidance document titled "standard 8 Staffing Level Assessment workbook" and accompanying "Instruction Guide" to incorporate the outcomes of Charges 1 and 2; and
>
> (4) Report back committee findings and recommendations to the 2020 Biennial Meeting.

Pilot Study

In August 2019, Subcommittee #2 met with the Program Standards Committee to discuss the work that had been completed on the new model development to date. A key decision made on the call was to pilot the proposed model with a pool of health departments across the nation. In September 2019, Subcommittee #2 conducted a pilot study of a proposed staffing level evaluation model as decided by the Program Standards Committee. The study consisted of sending a survey to health departments in order to obtain staffing level data and use the proposed model to analyze this data. A local health department led the study and the following report provides details on the Standard 8 Pilot Study.

Figure 1: Timeline

Methodology

Validation of the Proposed Model

In order to verify that the proposed model was statistically sound for the Pilot Study, Subcommittee #2 worked with Dr. Matthew Koslovsky, a Post-Doctoral Research Associate from Rice University focusing in Biostatistics. For his detailed C.V., **see Appendix; Item B: Dr. Koslovsky-CV**. He reviewed and approved the below methodology used to create the proposed model. This model was created by using data provided by 105 health departments. The logic behind the proposed model requires that food establishments be categorized by risk level (low, moderate, and high). The first step in creating the proposed model was to analyze if the inspection times and frequencies provided by the health departments were significantly related to the number of standards a health department had met. This was important, since the number of standards a health department met was the only information indicating their performance level. If health departments that met more standards had significantly different inspection times and frequencies than those that did not, it would have been better to only use those values. Statistical analysis demonstrated that there was no significant relationship between the number of standards a health department met and their responses related to inspection time and frequency. Due to this, it was considered sufficient to use either the average or median inspection time and frequency values of all respondents (Table 1). Further statistical analysis confirmed that the average and median inspection frequency and time values were significantly different for each risk category. In other words, inspection time and frequency was lower for low-risk establishments and was higher for high-risk establishments. Lastly, it was decided that the median, not the average, should be used to remove the effects of extreme values. Detailed data analysis including tests and p-values can be made available upon request.

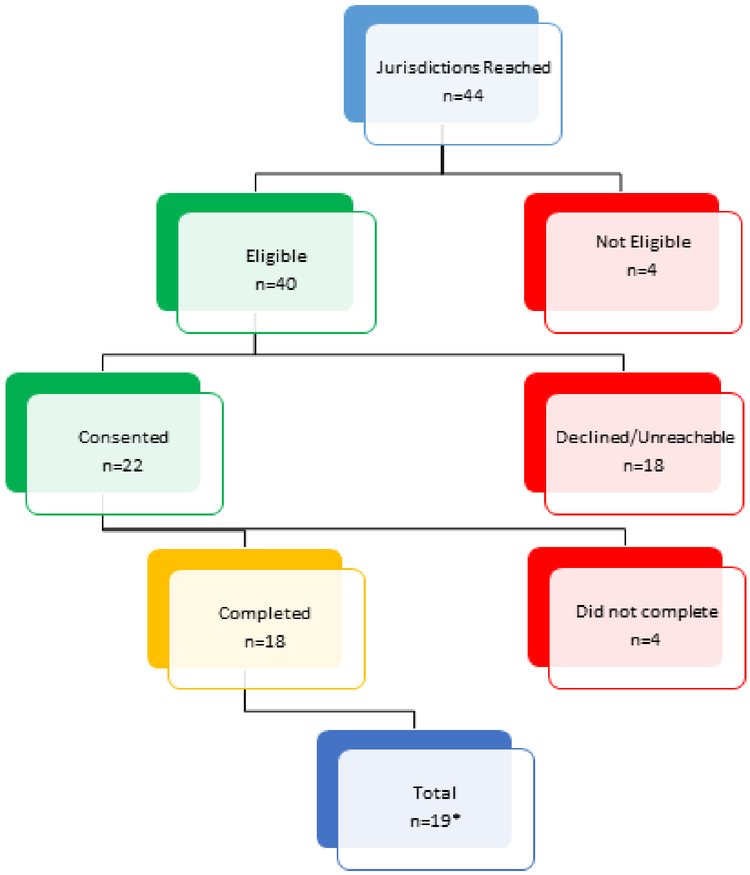
Table 1: Median Inspection Times/Frequencies by Number of Standards Met

# Standards Met		0	1	2	3	4	5	6 or more
Number of Jurisdictions		n = 22	n = 17	n = 19	n = 17	n = 11	n = 11	n = 8
Median Inspection Time in Hours	Low Risk	0.815	0.75	0.75	0.69	0.75	0.75	1
	Moderate Risk	1.105	1.5	1	1.375	1.5	1.25	1.585
	High Risk	1.875	2.5	1.75	2	2	1.75	2
Median Inspection Frequency per Year	Low Risk	1	1	1	1	1	1	1
	Moderate Risk	2	2	2	2	2	2	2
	High Risk	2	3	3	3	2.67	3	3

Sampling & Recruitment

In order to include health departments already involved in the Program Standards Committee, a mixture of non-random and random sampling was used. As shown in Figure 2, a total of 44 health departments were contacted to participate in the pilot. Of the 44 jurisdictions contacted, 13 were already involved with the Program Standards Committee and were aware of the purpose of the Pilot Study, the remaining 31 were chosen randomly from the list of original participants of the 2017 survey or were referred by an ineligible jurisdiction. Of the 40 eligible health departments, 22 consented to participate. Of the 22 consented health departments, 18 provided data, and 4 were not able to complete the survey. A total of 19 jurisdictions were included in the study once the local health department leading the study added their own data

Figure 2: Participation Flow-Chart



*Local health department leading Pilot Study added their own data

Data Collection

Participating health departments were given the option of providing the requested staffing level data either via a 1) weblink to a SurveyMonkey questionnaire **(see Appendix; Item C: Survey**) or 2) phone call as a guided interview with one of the Pilot Study team members. SurveyMonkey was chosen as the platform for collecting data in order to have an organized database of participant's responses. Participants were also provided a guidance document **(see Appendix; Item D: Guidance Document**) with useful definitions and descriptions to help interpret the questions and provide the appropriate data in the correct format. Upon recruitment, participating departments had one month (from August 30th until September 30th) to either complete the questionnaire on SurveyMonkey or schedule and complete through a phone call.

Survey Details

The survey aimed to collect data necessary to determine the total productive hours per FTE, total inspection hours each health department currently conducts, the total inspection hours each health department should be conducting, the total current FTE and the total required FTE. To determine the total productive hours for each jurisdiction, the survey included questions about the time spent traveling to inspections, conducting administrative work, and professional development as well as time spent on breaks, holiday, and vacation. To have a better understanding of total productive hours, the survey asked each jurisdiction to list all types of Environmental Health Specialist (EHS) employees (such as managers, supervisors, and regular EHS staff) and include the average percent of time that each employee spends on food inspections. A second objective of the survey was to obtain data which would allow us to observe each jurisdiction's method of categorizing inspections, as well as the average time spent on food-borne illness, routine, and other types of inspections.

Comparing Models

Participant data was taken from the SurveyMonkey database and moved to an Excel workbook where it was organized to review staffing levels for each health department. First, the data was run through the current Standard 8 model (**see Appendix, Item E: Standard 8 - Assessment Workbook)**. By doing this, we obtained the current FTE and inspection-to-FTE ratio for each health department. If a health department falls above or below the ratio, then the health department does not meet Standard 8. We then determined which departments "passed" or "failed" to meet the staffing level requirements using the current Standard 8 model.

The data was then analyzed using the proposed Standard 8 model **(see Appendix, Item F: Standard 8 - Proposed Model Workbook)**. The proposed model works by removing the inspection-to-FTE ratio and instead calculates how many FTEs a health department should have. It does this by first using a formula based on standardized inspection times and frequencies based on risk categories to calculate the total inspection hours for each jurisdiction. It automatically divides this total by the FTE productive hours calculated in the current model to obtain the number of FTEs the health department should have. Lastly, it "passes" the health department if the number of FTEs they currently has is greater than or equal to the number of FTES the HD should have. If the health department currently has an equal or greater number of FTEs, as calculated by the proposed model, then the health department would be considered sufficiently staffed; consequently, that health department would meet Standard 8. Finally, we checked which health departments "passed" or "failed" to meet the staffing level requirements using the proposed Standard 8 model.

Pilot Results

Jurisdiction Characteristics

A total of 16 States were represented in the Pilot Study. Of the 19 health departments, 16 jurisdictions were Local Health Departments, and the remaining 3 were State Health Departments or Agencies. After organizing the data, we observed each health department's characteristics such as total EHS employees, total inspections in a year, and total establishments in their jurisdictions (Table 2). Sizes of participating departments varied substantially, with the lowest number of EHS employees being 2 and the highest 99.

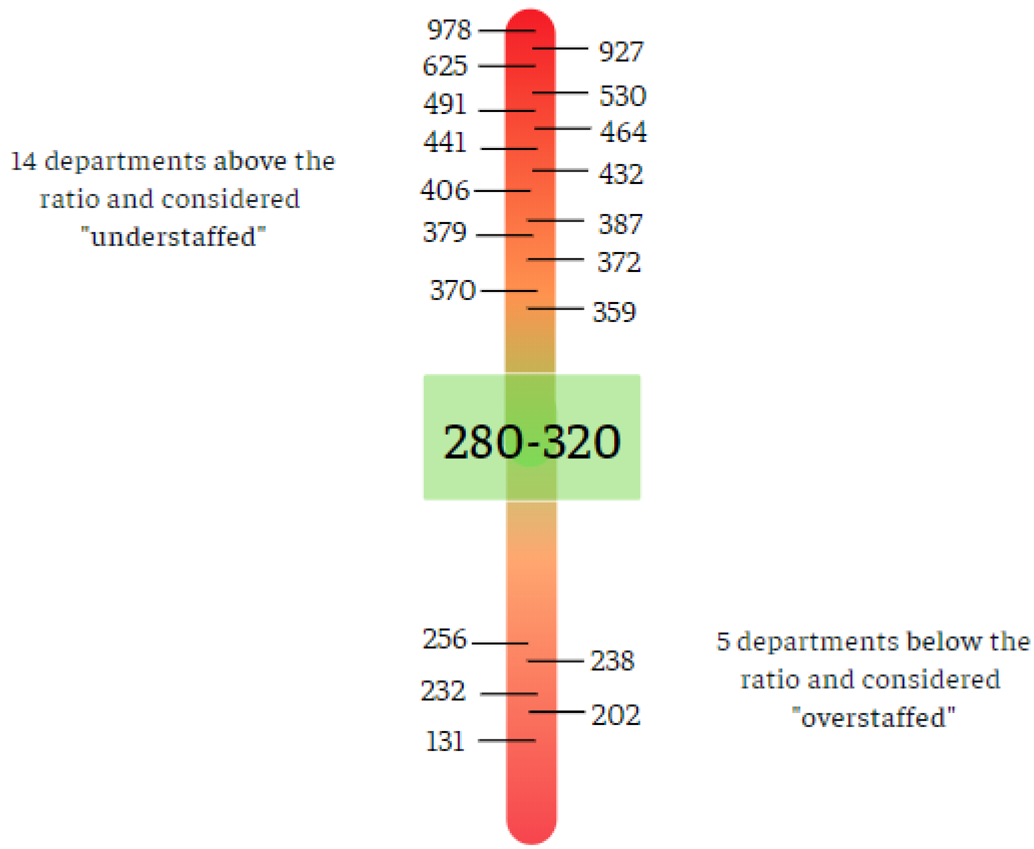
Table 2: Employees, total inspections, and total establishments per jurisdiction

Total Employees	Total Inspections	Total Establishments
2	512	128
2	144	109
4.6	764	585
6	464	303
6	488	262
7	1889	1889
7	1065	606
9	1676	961
9	1627	1384
9	1321	648
10	5475	3618
16	4518	6629
21.1	9211	6363
22	4655	2599
25	9490	4508
29.75	8015	3753
36	17463	8568
56	12623	8830
99	47216	25300

Current Model v Proposed Model

When analyzing the data using the current model, all (100%) of the participating health departments failed *Item 8.1: Staffing Level*. Of the 19 health departments, 5 fell below the established ratio of 280-320 inspections per FTE (Fig. 3). Falling below the ratio indicates that the health department is "overstaffed"; that is, each EHS is assigned too few inspections per year. The remaining 14 health departments fell above the ratio and were considered “understaffed”; in other words, each EHS is assigned too many inspections per year. A major problem with the current ratio is that health departments who are “overstaffed” should actually be considered sufficiently staffed, with each EHS assigned an attainable number of inspections to complete per year. If the 5 health departments who were “overstaffed” were not restricted by the ratio, they would have “passed” Standard 8, indicating a compliance rate of about 26%. The ratio seems to penalize health departments who have too many EHS.

Figure 3: “Understaffed” and “Overstaffed” departments based on current model



When analyzing the data using the proposed model, 10 (52.6%) health departments “passed” *Item 8.1: Staffing Level*. The model was able to confirm that those 10 health departments currently had an equal or greater number of EHS employees required to complete the inspections in their jurisdictions. The remaining 9 (47.4%) health departments “failed” to meet item 8.1. The model was able to confirm that those 9 health departments currently had a lower number of EHS employees required to complete the inspections in their jurisdictions.

When looking at the data more closely, there were a few interesting results that were observed between the jurisdictions that "failed" (n=9) and those who "passed" (n=10) the proposed model (Table 3). On average, jurisdictions who "passed" had less FTEs (8.6 vs 15.3), fewer employee position categories (3.2 vs. 4.2), and less food establishments categorized as high risk (24% vs 38%). Jurisdictions who "passed" also had, on average, more total productive hours (1337 vs. 1043) and more employees who dedicated a higher percent of their time to food inspections. Alternatively, jurisdictions that "failed" spent more time, on average, on travel (61 vs. 23 min/day) and administrative work (93 vs. 71 min/day). Another interesting observation was that of the 10 jurisdictions that "passed" in the proposed model, half (5) originally fell above the 280-320 ratio (overstaffed) and half fell below (understaffed).

Table 3: Differences of Jurisdictions who "Passed" or "Failed" the Proposed Model

	Total FTE	Total Productive Hours	Average travel time	Average administrative time	Average inspection/FTE ratio	Average "high-risk" establishments
Passing	8.6	1337	23 min/day	71 min/day	334	24%
Failing	15.3	1043	61 min/day	93 min/day	543	38%

Discussion

When using the proposed model, the number of jurisdictions who met *Item 8.1: Staffing Level,* increased by half (0% to 52%). If the jurisdictions who were "overstaffed" (5) based on the current model were not limited by the inspection-to-FTE-ratio, the number of jurisdictions meeting *Item 8.1: Staffing Level* in the proposed model would have only increased from 26% to 52%. This shows that using the ratio to evaluate staffing levels severely limits the ability to meet Standard 8. Further, the increase in passing rate between the current and proposed models would not have been as high if the ratio was not used.

This provides additional evidence that the current inspection-to-FTE ratio is an inadequate method to assess staffing levels. According to a survey by NACCHO, health departments reported completing Standard 1 (55%), Standard 3 (51%), Standard 6 (46%), and Standard 7 (49%). Similarly, the completion rate based on the proposed model (52%) can be considered comparable to the rates for other Program Standards. The characteristics observed among the participating health departments demonstrate the variability between health departments. We acknowledge that the proposed model cannot take into consideration all of the different factors that can impact staffing level. However, we believe the proposed model is a more reasonable and logical method to calculate staffing level.

For detailed contact information on the Pilot Study team refer to **Appendix, Item G: Pilot Study Team Roster**. Refer any questions/comments on the Pilot Study to any of the team members. Data can be made available upon request.

Recommendations

On October 21, 2019, the voting members from Subcommittee #2 voted to recommend a modification for Standard 8 to include adding the new proposed model assessment tool as an alternative method to determine compliance. Each jurisdiction that is completing a self-audit will have the option of either using the current or proposed model assessment tools. The intent of the recommendation is not to weaken the Standard, but to provide a secondary assessment tool that can measure practical performance of the enrollee against the Standard. This recommendation has been submitted as an issue for consideration in the Conference for Food Protection 2020 Biennial Meeting.

Appendix

Purpose of Standard 8 staffing level section:

Standard 8 Section 1. Staffing Level requires a health department (HD) to demonstrate that they have the staff "necessary to support an inspection and surveillance system that is designed to reduce risk factors and other factors know to contribute to foodborne illness"

Current criteria to pass Standard 8:

A HD currently meets this standard if they demonstrate an inspection to FTE ratio inspection-to-FTE ratio range of 280-320 inspections per FTE. The Conference for Food Protection (CFP) developed an assessment tool and instruction guide that <u>can be used</u> by a HD if desired. If not the HD has to calculate their inspection to FTE ratio through their own method and see if it falls within the required range.

Problem with inspection to FTE ratio range:

It has been agreed by upon by subcommittee that this range is problematic as it is based on the idea that every inspection should take 4 hours. There are two major problems we have identified with the inspection-to-FTE ratio:

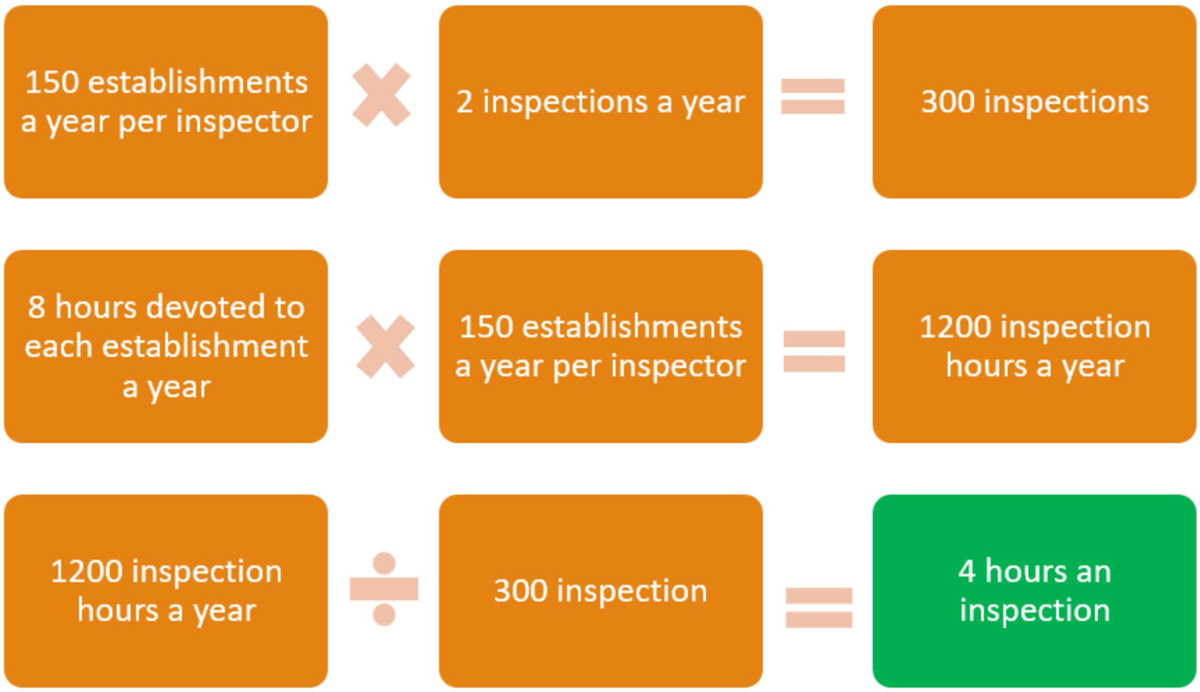
Problem 1:

- This range was created with the belief that every food inspection regardless of establishment type would take **4-hours**. This is problematic as health departments have establishments that vary by type and risk category making the required time to complete inspections also vary.

Problem 2:

- The very existence of a range creates the possibility that a HD can appear to be **overstaffed**. This creates the potential for that HD to have a ratio that goes below the bottom value of the 280-320 range (thus making the HD fail to meet the standard).

The logic behind the 4-hour inspection



Problems with these numbers

- **150 establishments a year per inspector** came from the 1961 International City Managers' Association the *Administration of Community Health Services https://babel.hathitrust.org/cgi/pt?id=mdp.39015072177739&view=1up&seq=177* book sharing that "there is no widely accepted formula on which to base the number of staff persons" but that "some local agencies" use 150
- **2 inspections a year** came from the *1976 Food Service Sanitation Manual https://babel.hathitrust.org/cgi/pt?id=umn.31951002840720j&view=1up&seq=29* that acknowledges the above 150 establishment number and adds without justification that "a minimum of two inspections of each establishment per year is required"
- **8 hours devoted to each establishment** comes from the 1997 FDA Food Code https://wayback.archive-it.org/7993/20170113023657/http:/www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/ucm054458.htm which suggests "8 to 10 hours be allocated per establishment year" also without evidence or clear reasoning

Conclusion: There appears to be no strong justification for any of these values based on real data and research making it problematic that they are the criteria from which the 4-hour inspection time is based.

Proposed Model Assessment Tool

The following is an example of how to use the updated assessment tool to calculate if a health department is adequately staffed.

Discussion on Table 1. The risk category column is broken into three categories, the minimum required by Standard 8. The number of establishments will be unique to each health department (HD). The rows in the remaining columns show values that are based off of survey data of 100 local and state health departments throughout the country (see footnotes for more details). A HD should feel free to use these values or input ones that more appropriately fit their organization.

Table 1.

Risk Category	Number of Establishments	Inspection Frequency[1]	Average Inspection Time (does not include travel)[2]	Reinspection frequency[3]	FBI Inspection Frequency[4]	Other Frequency[5]
Low	1,000	1	45 minutes	15%	1%	10%
Medium	2,000	2	75 minutes	15%	1%	10%
High	1,000	3	120 minutes	15%	1%	10%

Step 1. Calculate available annual inspection time per full time equivalent (FTE) using assessment tool. 1200 hours a year will be used for this example.

Step 2. Calculate number of FTE currently available at health department. This # is calculated in the current and updated assessment tools.

Step 3. Calculate total number of hours required to inspect each risk category. Formula for calculating # of inspection hours per risk type below (low risk type used for example):

(1000 establishments x 1 inspection a year = 1000 inspections) + (1000 establishments x 15 % reinspections a year = 150 inspections) + (1000 establishments x 1% FBI inspections a year = 10 inspections) + (1000 inspections x 10% other inspections a year = 100 inspections) = 1260 inspections a year x 45 minutes an inspection = 945 hours a year

Medium risk = 4520 inspections a year x 75 minutes = 5650 hours

High Risk = 3260 inspections a year x 120 minutes =6520 hours

Total inspection time = 945 + 5650 + 6520 = 13,115 inspection hours a year

Step 4. Calculate number of FTE's required

13,115 total inspection time hours /1200 inspection hours available per FTE = 10.93 FTEs

Step 5. Calculate if health department is adequately staffed

If FTEs currently available >= 10.93 FTEs that a HD should have then that HD is adequately staffed

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[1] Median inspection frequencies of 105 health departments from 2017 survey
[2] Median inspection times of 105 health departments from 2017 survey
[3] Median reinspection frequency %s of 60 health departments form 2017 survey2
[4] Median food borne illness inspection frequency %s of 60 health departments from 2017 survey2
[5] Final % value still being calculated, 10% being used for this demonstration

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RESEARCH INTERESTS

Theory and Methods: Bayesian modeling, variable selection, graphical models, nonparametric Bayes, statistical computing, multistate Markov models, R package development, varying-coefficient models, hidden Markov models, variational inference

Application: cancer prevention, smoking behaviors, mental health, addiction, physical activity, nutrition, microbiome, mHealth, ecological momentary assessment, intensive longitudinal data, environmental health, human health and performance in space

EDUCATION

The University of Texas Health Science Center, Houston, TX
Doctor of Philosophy, Biostatistics, GPA: 4.0/4.0 Dec 2016
· Minor: Health Promotions and Behavioral Sciences
· Title: Deterministic Bayesian variable selection developments for binary outcomes · Advisor: Michael D. Swartz, PhD

The University of Texas, Austin, TX
Bachelor of Science, Mathematics Aug 2011
· Concentration: Scientific Computation

EXPERIENCE

Rice University, Houston, TX
Post-Doctoral Research Associate March 2018 - Current
· NSF/RTG Post-Doctoral Fellowship in Data Science
· Advisor: Marina Vannucci, PhD

KBRwyle, Houston, TX
Biostatistician July 2016 - March 2018
· Human Health and Performance Contract
· Johnson Space Center

The University of Texas Health Science Center, Houston, TX
Pre-Doctoral Fellow Jan 2015 - Dec 2016
· National Cancer Institute Pre-Doctoral Fellowship
· Cancer Education and Career Development Program

Pre-Doctoral Trainee Aug 2013 - Jan 2015
· National Institutes of Health Pre-Doctoral Traineeship

Science Systems and Applications, Inc., Hampton, VA
Summer Intern May 2014 - Aug 2014
· DEVELOP National Program
· Langley Research Center

National Space Biomedical Research Institute, Houston, TX
Summer Apprentice May 2013 - Aug 2013
· Biostatistics
Laboratory · Johnson
Space Center

Cancer Prevention and Research Institute of Texas, Austin, TX
Summer Intern May 2010 - Oct 2010
· University of Texas School of Public Health
· Biostatistics Department

TEACHING EXPERIENCE

University of Texas Health Science Center, Department of Biostatistics and Data Science
Lecturer (Ad Hoc), Foundations of Biostatistics (PH1690) Fall 2019
Lecturer (Ad Hoc), Foundations of Biostatistics (PH1690) Summer 2019
· Student evaluation of overall effectiveness - 4.86/5.0
Teaching Assistant, Theory of Biostatistics II (PH1911) Spring 2016
Teaching Assistant, Linear Models (PH1915) Fall 2015
Teaching Assistant, Intermediate Biostatistics (PH1700) Fall 2015 Teaching Assistant, Applied Statistical Analysis I (PH1820) Summer 2015 Teaching Assistant, Applied Statistical Analysis II (PH1821) Spring 2013

PUBLICATIONS

Submitted/In Progress

1. **Koslovsky, M.D.** & Vannucci, M. DTMbvs: Dirichlet-tree multinomial regression models with Bayesian variable selection for microbiome Data - an R package. *BMC Bioinformatics*. (Revised)
2. **Koslovsky, M.D.**, Hoffman, K., Daniel-MacDougall, C., & Vannucci, M., A joint model for predicting phenotypic responses with human microbiome data. (Submitted)
3. **Koslovsky, M.D.**, H´ebert, E.T., Businelle, M.S., & Vannucci, M. An efficient Bayesian varying-coefficient modeling approach for behavioral mHealth data. (Submitted)
4. Rosenberg, M.J., **Koslovsky, M.D.**, Noyes, M., Reschke, M.F., & Clement, G. Tandem Walk in Simulated Martian Gravity and Visual Environment. (Submitted)
5. **Koslovsky, M.D.**, Liang, M.†, & Vannucci, M. A Bayesian hidden Markov model for accommodating social desirability bias in mHealth data. (In Progress)

6. Shaddox, E.†, **Koslovsky, M.D.**, & Vannucci, M. A Spiked Dirichlet Process Prior for Joint Network Inference. (In Progress)
7. H´ebert, E.T., **Koslovsky, M.D.**, & Businelle, M.S. Time-varying relations for smoking behaviors captured in a novel, smartphone-based just-in-time adaptive intervention. (In Progress)
8. Denti, F.‡, **Koslovsky, M.D.**‡, Guindani, M., Vannucci, M., & Whiteson, K.L. Bayesian models for understanding the modulating factors of microbiome data. In S. Datta & S. Guha (Eds.), *Statistical Analysis of Microbiome Data*. Springer Verlag. (In Progress)

† indicates PhD student in Dr. Vannucci's research group at Rice University ‡ indicates equal contribution

Statistical Methodology

9. **Koslovsky, M.D.**, Swartz, M.D., Chan, W., Leon-Novelo, L., Wilkinson, A.V., Kendzor, D.E., & Businelle, M.S. (2018). Bayesian variable selection for multistate Markov models with interval-censored data in an ecological momentary assessment study of smoking cessation. *Biometrics*, **74(2)**, 636-644.
10. **Koslovsky, M.D.**, Swartz, M.D., Leon-Novelo, L., Chan, W., & Wilkinson, A.V. (2018). Using the EM algorithm for Bayesian variable selection in logistic regression models with related covariates. *Journal of Statistical Computation and Simulation*, **88(3)**, 575-596.

Applications

11. Zwart, S.R., Rice, B.L., Dlouhy, H., Shackelford, L.C., Heer, M., **Koslovsky, M.D.**, & Smith, S.M. (2018). Dietary acid load and bone turnover during longduration spaceflight and bed rest. *The American Journal of Clinical Nutrition*, **107(5)**, 834-844.
12. Conkin, J., Sanders, R.W., **Koslovsky, M.D.**, Wear, M.L., Kozminski, A.G., & Abercromby, A.F. (2018). A systematic review and meta-analysis of decompression sickness in altitude physiological training. *Aerospace Medicine and Human Performance*, **89(11)**, 941-951.
13. **Koslovsky, M.D.**, H´ebert, E.T., Swartz, M.D., Chan, W., Leon-Novelo, L., Wilkinson, A.V., Kendzor, D.E. & Businelle, M.S. (2017). The time-varying relations between risk factors and smoking before and after a quit attempt. *Nicotine and Tobacco Research*, **20(10)**, 1231-1236.
14. Conkin, J., Wessel, J.H., Norcross, J.R., Bekdash, O.S., Abercromby, A.F., **Koslovsky, M.D.**, & Gernhardt, M.L. (2017). Hemoglobin oxygen saturation with mild hypoxia and microgravity. *Aerospace Medicine and Human Performance*, **88(6)**, 527-534.

Proceedings

15. Meyers, J., Garcia, Y., Arellano, J., Boley, L., Goodenow D., Kerstman, E., **Koslovsky, M.D.**, Reyes, D., Saile, L., Taiym, W., & Young, M. (2018, September 16-21). Validation of the NASA Integrated Medical Model: A Space Flight Medical Risk Prediction Tool. Paper presented at *Probabilistic Safety Assessment and Management 14*, Los Angeles, CA.

PRESENTATIONS

- **Koslovsky, M.D.***, Hoffman, K., Daniel-MacDougall, C., & Vannucci, M. "A Bayesian Model of Microbiome Data for Simultaneous Identification of Covariate Associations and Prediction of Phenotypic Outcomes." Joint Statitsics Meetings, Denver, CO. Aug 2019. (contributed poster presentation)
- **Koslovsky, M.D.***, Hoffman, K., Daniel-MacDougall, C., & Vannucci, M. "A Bayesian Model of Microbiome Data for Simultaneous Identification of Covariate Associations and Prediction of Phenotypic Outcomes." BigDIA, Houston, TX. Dec 2018. (contributed poster presentation)
- Yu, D., Sedory, A.C., Mohammadi, K., **Koslovsky, M.D.**, & Swartz, M.D.*. "*Trio RVEMVS*: A fast Bayesian variable selection method for trios that identifies individual rare variants," International Genetic Epidemiology Society Meetings, San Diego, CA, Oct 2018. (platform presentation)
- **Koslovsky, M.D.***, Arellano, J., Schaefer, C., Feiveson, A., & Young, M. "CommClust: A network-based algorithm for clustering multivariate repeated measures data." NASA HuMan Research Program Investigators' Workshop. Galveston, TX. Jan 2018. (contributed poster presentation)

AWARDS

- Dr. M. Stewart West Memorial Scholarship, 2015
- UTHealth Division of Biostatistics Travel Award, 2015
- Richard D. Remington Memorial Student Scholarship, 2014
- Robert. H Bigelow Endowed Scholarship, 2013

MENTORING

- Yefei Zhang, UTHealth, PhD Biostatistics candidate, Dissertation Committee, 01/2017-Current
- Scott Liang, Rice University, PhD Statistics student, Co-mentor, 03/2019Current
- James Warner, Rice University, Rice Undergraduate Data Science Summer Program, 2018
- Karan Adams, Rice University, Rice Undergraduate Data Science Summer Program, 2018
- Stoyan Komitov, Rice University, Rice Undergraduate Data Science Summer Program, 2018
- Alex Aguilar, Rice University, PhD Statistics candidate, NASA Summer Intern, 2018
- Austin Vo, University of Central Florida, NASA Summer Intern, 2017
- UTHealth New Student Mentor, Fall 2013

COMPUTER SKILLS

Languages & Software: R, C++, Rcpp, Shiny, LATEX, STATA, SAS, WinBUGS

PROFESSIONAL AFFILIATION

Member
- American Statistical Association, 2015 – Current

PROFESSIONAL SERVICE

Reviewer
- Biometrical Journal, Biometrics, Biostatistics, Nature Communications

Board Member
- Johnson Space Center IRB

Board Member
- Conference for Food Protection: Program Standards Committee, KBRwyle, NASA

CONTINUING SERVICE

- HACASA - Short Course "Randomized Clinical Trials replacing Traditional Analyses with Better Alternatives," Houston, TX, May 2018
- Joint Statistical Meetings - Short Course "Network Meta-Analysis," Baltimore, MD, Aug 2017
- NASA Human Research Program Investigator's Workshop - "A New Dawn: Enabling Human Space Exploration," Galveston, TX, Jan 2017
- Technology Collaboration Center - "Omics Workshop," Houston, TX, Spring 2017
- Tableau Conference 2016 - Tableau Classroom Training- "Tableau Desktop II," Austin, TX, Fall 2016

- ENAR - Short Course "An Introduction to Statistical Machine Learning," Austin, TX, Spring 2016
- ENAR - Tutorial Session - "Data Visualizations in R with shiny and ggplot2," Austin, TX, Spring 2016
- ENAR - Tutorial Session - "High Performance Computing with R," Austin, TX, Spring 2016
- ASA Biopharmaceutical Section FDA - Industry Statistics Workshop - "Equivalence and Similarity Testing," Washington, DC, Fall 2015
- ASA Biopharmaceutical Section FDA - Industry Statistics Workshop - "Designing Observational Comparative Studies Using Propensity Score Methodology in Regulatory Settings," Washington, DC, Fall 2015
- Joint Statistical Meetings - "Adaptive Methods for Modern Clinical Trials," Seattle, WA, Summer 2015
- UT Summer Statistics Institute - "Introduction to Mixed Models with Applications," Austin, TX, Summer 2015
- UT Summer Statistics Institute - "Big Data Analytics," Austin, TX, Summer 2015

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Standard 8 Pilot Survey

Subcommittee #2 established by the Program Standards Committee is conducting a survey to pilot a model evaluating the staffing requirements as outlined by Standard 8 of the Voluntary National Retail Food Regulatory Program (FDA). The purpose of this survey is to collect the necessary data to conduct a staffing level audit for your Health Department.

You will need to use the guidance documented provided to assist you in filling out the information on the survey.

1. Please provide your name and jurisdiction

2. On average, how many hours per year do EHS (Environmental Health Specialist) employees spend on the following:
(If not applicable, please answer "N/A")

Holiday

Vacation

Sick leave

Family/Personal leave

3. On average, how many hours per year do your EHS employees spend on the following:
(If not applicable, please answer "N/A")

Traveling to/from inspections

Administrative work

Break time

Professional development (training, continuing education)

4. Please list <u>all employees</u> who conduct food safety inspections using the following format:

Title of position, % of time dedicated to food safety inspections, number of this type of employee in your health department
Example: Environmental Health Specialist-Training, 60%, 12

(If less than 6 positions, please answer "N/A" for empty boxes)

Position 1

Position 2

Position 3

Position 4

Position 5

Position 6

5. Please provide the total number of inspections related to food safety conducted for your department's entire jurisdiction in one year.

6. How many of each of the following establishments does your department conduct inspections on?

(If not applicable, please answer "N/A")

Low-risk

Moderate-risk

High-risk

7. How many routine inspections were conducted in 2018?

8. How many permitting inspections were conducted in 2018?

*9. What is the average time spent conducting each of the following inspections in your department?
(If not applicable, please answer "N/A")

*Note: Please specify when using hours or minutes.

Follow-ups/reinspections

Food-borne illness complaints

Complaint investigations

Outbreak investigations

Compliance follow-up inspections

Risk assessment reviews

Process reviews

Variance process reviews

Final construction inspections

Other

INSTRUCTIONS FOR PROVIDING DATA REQUESTED FOR PILOT

Guidance Notes:
These notes are intended to guide the survey process by providing you with definitions, examples, and instructions on how to answer the survey questions. We also suggest where you might find the information needed if you do not have it readily available. Use the checklist provided on Page 3 ensure you have all the information to fill this survey.

Question 1:

"Holiday, Vacation, Sick Leave, Family Personal Leave" - These hours may vary by seniority of staff or other factors, please provide the best average for a 100% full-time EHS staff. Your Human Resources department may be a good resource to obtain some of this information.

Question 2:

"Traveling to/from inspections" - Districts vary in size and therefore this number will be different across health departments. Please use a best estimate or average time for a full-time equivalent EHS staff.

"Administrative work" - This includes any office time and administrative work an EHS employee does outside of food inspection. This does **NOT** include completing the inspection report.

"Professional development" - This includes things like training and continuing education.

Question 3:

"Employees who conduct food safety inspections" - For this question, we ask that you take time to consider *all of the employees that conduct food safety inspections*. Most health departments have inspectors whose time is dedicated solely to food safety, but have others that may dedicate only a small percentage of their time to food. For example, supervisors may conduct inspections, but only dedicate about 10% of their time to this. Use as many rows as needed to list all types of employees who conduct food inspections, even if their job titles are similar. For example:

1. EHS I, 80%, 15
2. EHS II, 60%, 5
3. EHS Supervisor, 40%, 2
4. EHS Manager, 5%, 1

Question 4:

"Total number of inspections" - Inspections are defined as routine inspections, re-inspections, complaint investigations, outbreak investigations, compliance follow-up inspections, risk assessment reviews, process reviews, variance process reviews, foodborne illness complaint response, final construction inspections and other direct establishment contact time

such as on-site training that is performed by the field inspection staff. (Standard 8 Staffing Level Assessment Workbook: Instruction Guide, page 10).

Question 5:

"Low - *Moderate* - *High Risk"* - Do your best to categorize all of your establishments into low, moderate, and high risk categories.

- If you have more than three categories, attempt to distribute your establishments into the categories provided.
- If you currently use fewer than three categories (Example: Low and High), then only provide the number of establishments for those categories and leave the unused one blank.
- If you do not already have a process in place to categorize food establishments in your jurisdiction, the FDA Food Code has a recommended guide to assist with categorizing, refer to Annex 5, Table 1 (Page 4 of this document). You can also review a recommendation of how to categorize your establishments below:

    1. **Low risk establishments** = Examples include most convenience store operations, or establishments that sell pre-packaged or non-TCS (temperature control for safety) food.
    2. **Moderate risk establishments** = Examples may include retail food store operations. They may have a limited menu. Most products are prepared/cooked and served immediately.
    3. **High risk establishments** = Examples include full service restaurants. Extensive menu and handling of raw ingredients. Complex preparation including cooking, cooling, and reheating for hot holding involves many TCS foods.

Question 6 & 7:

"Routine Inspections" - A full review and evaluation of a food establishment's operations and facilities to assess its compliance with food safety law, at a planned frequency determined by the regulatory authority. This does not include re-inspections and other follow-up or special investigations.

"Permitting Inspections" - A review of a food establishment's operations and facilities to determine if a permit will be issued for the establishment to operate.

Question 8:

"Average time" - For each category determine the time spent on the activity from beginning to end, plus any writing and delivering reports if applicable. For example, for follow-up/re-inspections: average time = (inspection start to finish) + writing and delivering report. Leave blank if category is not applicable to your jurisdiction.

CHECKLIST

Before starting the survey please gather all information mentioned on the below checklist. It is vital to the success of this pilot study that you try and obtain as accurate of information as possible.

Note: Annual Non-Inspection Hours and Annual Productive Hours are for an EHS employee dedicated to 100% food inspections. While there may be some variation in these hours per employee please provide the best possible average.

Annual Non-Inspection Hours

- ❑ Holiday
- ❑ Vacation
- ❑ Sick Leave
- ❑ Family/Personal Leave

Annual Productive Non-Food Inspection Hours

- ❑ Travel time to and from inspections
- ❑ Administrative work (not including inspection reports)
- ❑ Break time (lunch, break, etc.)
- ❑ Professional development (training, continuing education)

EHS or Related Positions

- ❑ A list of all types of EHS personnel or related positions (ANYONE who conducts a food establishment inspection)
- ❑ % of time dedicated to food safety inspections for all above position types
- ❑ # of employees in each position

Other Inspection Data

- ❑ Total number of food safety inspections conducted in 2018
- ❑ List of all food establishments in your jurisdiction
- ❑ How many routine/permitting inspections were conducted in 2018
- ❑ Average time spent conducting follow-up/re-inspections, food-borne illness complaints, and other

Annex 5, Table 1. Risk Categorization of Food Establishments

RISK CATEGORY	DESCRIPTION	FREQUENCY #/YR
1	Examples include most convenience store operations, hot dog carts, and coffee shops. Establishments that serve or sell only pre-packaged, non- time/temperature control for safety (TCS) foods. Establishments that prepare only non-TCS foods. Establishments that heat only commercially processed, TCS foods for hot holding. No cooling of TCS foods. Establishments that would otherwise be grouped in Category 2 but have shown through historical documentation to have achieved active managerial control of foodborne illness risk factors.	1
2	Examples may include retail food store operations, schools not serving a highly susceptible population, and quick service operations. Limited menu. Most products are prepared/cooked and served immediately. May involve hot and cold holding of TCS foods after preparation or cooking. Complex preparation of TCS foods requiring cooking, cooling, and reheating for hot holding is limited to only a few TCS foods. Establishments that would otherwise be grouped in Category 3 but have shown through historical documentation to have achieved active managerial control of foodborne illness risk factors. Newly permitted establishments that would otherwise be grouped in Category 1 until history of active managerial control of foodborne illness risk factors is achieved and documented.	2
3	An example is a full service restaurant. Extensive menu and handling of raw ingredients. Complex preparation including cooking, cooling, and reheating for hot holding involves many TCS foods. Variety of processes require hot and cold holding of TCS food. Establishments that would otherwise be grouped in Category 4 but have shown through historical documentation to have achieved active managerial control of foodborne illness risk factors. Newly permitted establishments that would otherwise be grouped in Category 2 until history of active managerial control of foodborne illness risk factors is achieved and documented.	3
4	Examples include preschools, hospitals, nursing homes, and establishments conducting processing at retail. Includes establishments serving a highly susceptible population or that conduct specialized processes, e.g., smoking and curing; reduced oxygen packaging for extended shelf-life.	4

AGENCY

Standard 8: Staffing Levels
FTE (Full-Time Employee) Data

DATE

FTE DATA CALCULATIONS				
Program Description and Supporting Information:				
FOOD SAFETY PROGRAM FTE HOURS PER YEAR				
Annual FTE Hours Per Year: Industry Standard		**2080**		
	Local Holiday Hours Per Year			
	Local Vacation Leave Hours Per Year			
	Local Sick Leave Hours Per Year			
	Local Family-Personal Leave Hours Per Year			
Annual FTE Hours Per Year: Local Inspector		**2080**		
	Productivity Factoring			
	Personal Development Time			
Productive Annual FTE Hours Per Year (FTE Conversion Factor): Local Inspector		**2080**		

FOOD SAFETY INSPECTION HOURS PER YEAR			
Position Category	**Food Safety Inspection Hours**	**Number of Employees**	**Total Food Safety Inspection Hours**
			0
			0
			0
			0
Total Food Safety Inspection Hours			**0**
Other Local Inspector EH Inspection Hours			0
Actual Food Safety Inspection Hours			**0**
Total Local FTE			**0.0**

AGENCY

Standard 8: Staffing Levels
Inspection-to-FTE Ratio

DATE

INSPECTION-TO-FTE RATIO	
In accordance with Standard 8 Self-Assessment Guidance provided in the January 2011 version of the Program Standards, the Inspection-to-FTE Ratio must fall between 280 and 320.	
Local program number of Food Safety Inspections	0
Local program number of FTEs	0.0
Inspection-to-FTE RATIO	**#DIV/0!**

FTE DATA CALCULATION

Calculate productive hours per year for an employee doing 100% food inspections

Information For One Employee		Hours/Year	Hours/Day	Total Hours
Annual FTE Hours Per Year: Industry Standard				2080
	Local Holiday Hours Per Year			0
	Local Vacation Leave Hours Per Year			0
	Local Sick Leave Hours Per Year			0
	Local Family-Personal Leave Hours Per Year			0
Productivity Factoring Per Year				
	Travel Time For Inspection			2080
	Administrative Work (in-office work)			2080
	Break time			2080
	Others			2080
Personal Development Time Per Year				
	Professional Development			2080
	Others			2080
Productive Annual FTE Hours Per Year (FTE Conversion Factor)				**2080**

FOOD SAFETY INSPECTION HOURS PER YEAR

Position Title	Percent of time spent on food inspections	Number of Employees	Total Hours
			0
			0
			0
			0
			0
			0
Total Food Safety Inspection Hours			**0**
Total Current FTE			**0.00**

STANDARD 8's REQUIRED FTE FOR YOUR JURISDICTION

	Low Risk Establishments	Frequency of Low Risk Est Inspections Per Year	Moderate Risk Establishments	Frequency of Moderate Risk Est Inspections Per Year	High Risk Establishments	Frequency of High Risk Est Inspections Per Year	Total
Routine and Permitting		1.00		2.00		3.00	0
Follow Up Inspections/Reinspections							0
Foodborne Illness Complaints							0
Other							0
Total Number of Required Inspections							**0**
Median Hours Spent Per Inspection	0.75		1.25		2.00		
Total Inspection Time							0
Total Required FTE							**0.00**
Standard 8.1 Staffing Level							Standard not met

Sources
-2017 Subcommittee # 2 - Survey 1 and 2
-2019 Pilot Study

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*Riddhi Patel conducted the 2017 survey and originally developed the proposed model from which all this work was based on.