



A Matter of Time: Exploring Variation in Food and Drug Administration *Food Code* Adoption Among State Retail Food Regulatory Agencies

Abstract Frequent and timely state adoption of the Food and Drug Administration *Food Code* signals a commitment to the use of contemporary science-based interventions for the control of foodborne illness risk factors in retail food establishments. The regularity with which states adopt each new edition of the *Food Code*, however, remains unclear. This study examined the relationship between mode and frequency of adopting the most current edition of the *Food Code* over time among 64 state retail food regulatory agencies. Among agencies that adopted an edition of the *Food Code*, the amount of time until adoption was approximately 1.4 years for the 2013 *Food Code* (current), 3.5 years for the 2009 *Food Code* (recent), and 3.3 years for the 2005 *Food Code* (older). When considering adoption over time, approximately 23% of agencies tended to adopt a current edition (current adopters) of the *Food Code*, 41% of agencies tended to adopt recent editions (moderate adopters), and 36% of agencies tended to adopt older editions (late adopters). There was no significant difference, however, in the odds of an agency being a current, moderate, or late adopter, regardless of an agency's mode of adoption.

Introduction

State legislatures and regulatory agencies in the U.S. have long adopted model codes into the construction and public safety regulations of their jurisdictions (Nelson, 2012; Wilking, Cradock, & Gortmaker, 2015). Adoption of model codes allows jurisdictions to stay consistent with consensus-based guidelines intended to safeguard public safety. Most of the more than 2,000 agencies responsible for regulating the retail food and food service establishments in the U.S. have based their retail food safety regulations on one of eight editions of the Food and Drug Administration (FDA) *Food Code*, which provides a uniform

system of provisions that address the safety and protection of food offered in retail and food service establishments (FDA, 2019).

As a model code, the *Food Code* provides a technical and legal basis for regulating the retail segment of the food industry at all levels of government (Grossman, 2014). Adoption of the *Food Code* indicates consistency with national food regulatory policy and a commitment to the goal of preventing and reducing the incidence of foodborne illness in retail and food service establishments in the U.S. (Levitt, 2001). With a full edition issued every 4 years, the frequent and timely adoption of each new edition of the *Food*

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Code ensures retail food regulatory policy incorporates the most current food safety principles and science-based interventions (FDA, 2020a).

The influence of the *Food Code* on state retail food regulatory policy is a distinct example of vertical policy diffusion, a situation where national policy influences state-level program and policy adoptions (Gilardi, 2016; Lyson, 2016; Shipan & Volden, 2012; Starke, 2013). In certain cases of vertical policy diffusion, or influence, the federal government mandates state adoption of a national policy, which fosters uniform adoption (Allen, Pettus, & Haider-Markel, 2004). In other cases of vertical diffusion, the federal government promotes policy adoption but states have discretion over their decision to adopt the policy. This latter type of vertical influence can result in a number of differing policies at the state level intended to address the same issue (Lyson, 2016).

Currently, state and local regulators come together with industry, academia, consumers, and federal government stakeholders at the biennial Conference for Food Protection (CFP) to propose and deliberate recommendations to amend the *Food Code*. Based on the outcome of these deliberations, CFP submits

TABLE 1

Mode of Food Code Adoption Among State Regulatory Agencies (N = 64)

Mode of Adoption	Agency # (%)
Adopt-by-reference	26 (40.62)
Section-by-section	38 (59.38)

recommended *Food Code* changes to FDA for evaluation and a decision on which changes to implement. The CFP process, therefore, perpetuates interdependence between federal and state regulators. FDA depends on the involvement of state regulators in stakeholder deliberations that influence the provisions of the *Food Code* and state regulators depend on FDA to ensure that the provisions of the *Food Code* are informed by science and in a form that can be easily adopted by state legislatures and regulatory agencies.

While *Food Code* adoption is encouraged, it is ultimately voluntary and at the discretion of state regulators. Since its inception in 1993, the *Food Code* was issued biennially through 2001. As of 2005, the full edition of the *Food Code* has been issued every 4 years. All 50 states and the District of Columbia have adopted an edition of the *Food Code* (FDA, 2019). Jurisdictions adopt the *Food Code* in various modes: in its entirety (termed adopt-by-reference or complete adoption) or in a section-by-section approach using specific *Food Code* provisions as the basis for drafting or amending their own regulations. As newer editions of the *Food Code* are released, jurisdictions periodically move toward adoption. The frequency with which jurisdictions adopt the most recently published edition (current) of the *Food Code* over time, however, has not been investigated. The purpose of this study was to investigate the relationship between mode of *Food Code* adoption and frequency of adopting a current edition of the *Food Code* over time.

Methods

Sample and Mode of Food Code Adoption

The study sample included 64 retail food regulatory agencies from all 50 states and the

FIGURE 1

List of State Regulatory Agencies Examined (N = 64)

Alabama Department of Public Health (AL DPH)	Missouri Department of Health and Senior Services (MO DHSS)
Alaska Department of Environmental Conservation (AK DEC)	Montana Department of Health and Human Services (MT DHHS)
Arizona Department of Health Services (AZ DHS)	Nebraska Department of Agriculture (NE DOA)
Arkansas Department of Health (AR DOH)	Nevada Department of Health and Human Services (NV DHHS)
California Department of Public Health, Food and Drug Program (CA DPH)	New Hampshire Department of Health and Human Services (NH DHHS)
Colorado Department of Health and Environment (CO DHE)	New Jersey Department of Health and Senior Services (NJ DHSS)
Connecticut Department of Consumer Protection (CT DCP)	New Mexico Environment Department (NM ED)
Connecticut Department of Public Health (CT DPH)	New York Department of Agriculture (NY DOA)
Delaware Division of Public Health and Social Services (DE DPHSS)	North Carolina Division of Public Health (NC DPH)
District of Columbia Department of Health, Regulation and Licensing (DC DOH)	North Dakota Department of Health, Division of Food and Lodging (ND DOH)
Florida Department of Agriculture (FL DOA)	Ohio Department of Agriculture (OH DOA)
Florida Department of Business and Professional Regulation (FL DBPR)	Ohio Department of Health (OH DOH)
Florida Department of Health (FL DOH)	Oklahoma State Department of Health (OK DOH)
Georgia Department of Agriculture (GA DOA)	Oregon Department of Agriculture (OR DOA)
Georgia Department of Public Health (GA DPH)	Oregon Health Authority (OR HA)
Hawaii State Department of Health, Sanitation Branch (HI DOH)	Pennsylvania Department of Agriculture (PA DOA)
Idaho Department of Health and Welfare (ID DHW)	Rhode Island Department of Health, Office of Food Protection (RI DOH)
Illinois Department of Public Health (IL DPH)	South Carolina Department of Health and Environmental Control (SC DHEC)
Indiana State Department of Health (IN DOH)	South Dakota Department of Health (SD DOH)
Iowa Department of Inspections and Appeals (IA DIA)	Tennessee Department of Agriculture (TN DOA)
Kansas Department of Agriculture (KS DOA)	Tennessee Department of Health, Environmental Health Division (TN DOH)
Kentucky Cabinet for Health and Family Service (KT CHFS)	Texas Department of State Health Services (TX DSHS)
Louisiana Department of Health and Hospitals (LA DHH)	Utah Department of Agriculture and Food (UT DAF)
Maine Department of Agriculture (ME DOA)	Utah Department of Health (UT DOH)
Maine Department of Human Services (ME DHS)	Vermont Department of Health (VT DOH)
Maryland Department of Health and Mental Hygiene (MD DHMH)	Virginia Department of Agriculture (VA DOA)
Massachusetts Department of Public Health (MA DPH)	Virginia Department of Health (VA DOH)
Michigan Department of Agriculture (MI DOA)	Washington State Department of Health, Environmental Health (WA DOH)
Minnesota Department of Agriculture (MN DOA)	West Virginia Department of Health and Human Resources (WI DHHR)
Minnesota Department of Health (MN DOH)	Wisconsin Department of Agriculture (WI DOA)
Mississippi Department of Agriculture (MS DOA)	Wisconsin Department of Health Services (WI DHS)
Mississippi Department of Health (MS DOH)	Wyoming Department of Agriculture (WY DOA)

District of Columbia. The retail food regulations for the 64 agencies available on July 1, 2017, were identified using Lexis Advance. Two independent researchers assessed the regulations for specific statements that the *Food Code* was adopted-by-reference. Adopting-

by-reference involves adopting the code in its entirety with no or only slight modifications. If the agency was found to adopt-by-reference, the *Food Code* edition being adopted was recorded. For regulations that did not indicate the *Food Code* was adopted-by-reference, it

was recorded as adoption using a section-by-section approach. For these agencies, the 2016 FDA report on *Food Code* adoption was used to obtain the edition of the most recent code adopted (FDA, 2019).

Time Until Adoption

The *Food Code* editions investigated in this study were the 2005, 2009, and 2013 editions. We used the *Food Code* adoption data collected in 2008, 2012, 2013, 2014, 2015, and 2016 by the Association of Food and Drug Officials under contract with FDA to determine the year a *Food Code* was adopted. Time until *Food Code* adoption—the amount of time taken to adopt a specific edition of the *Food Code*—was computed for each agency that adopted a given edition of the *Food Code* using the year of adoption or data collection year minus the year the edition was available for adoption. For the purpose of this study, the year available for adoption was set to the beginning of the year following the initial release year. This designation was due to variations in the exact month within the initial release year each full edition was published. For example, the 2005 *Food Code* had an initial release year of 2005; therefore, the year the edition was available for adoption was designated as 2006. As such, if the 2005 *Food Code* was available for adoption in 2006, an agency that adopted this edition in 2016 would have a time until adoption value of 10 years.

Duration Since Adoption of the Most Recent Edition of the *Food Code*

Duration since adoption of the most recent edition (DRE) was indicated by a designation of short (S), medium (M), or long (L) for each of 6 years (2008, 2012, 2013, 2014, 2015, and 2016), taking into consideration the 4-year period between the release of the 2005, 2009, and 2013 *Food Code*, respectively. For the specific years investigated, a designation of short was given if the edition of the *Food Code* adopted was always ≤4 years from the most recently published edition of the *Food Code* (current edition). A designation of medium was given if the most recent edition of the *Food Code* adopted was always >4 years but ≤8 years (recent edition) from the publication of the current edition. A designation of long was given if the most recent edition of the *Food Code* adopted was always

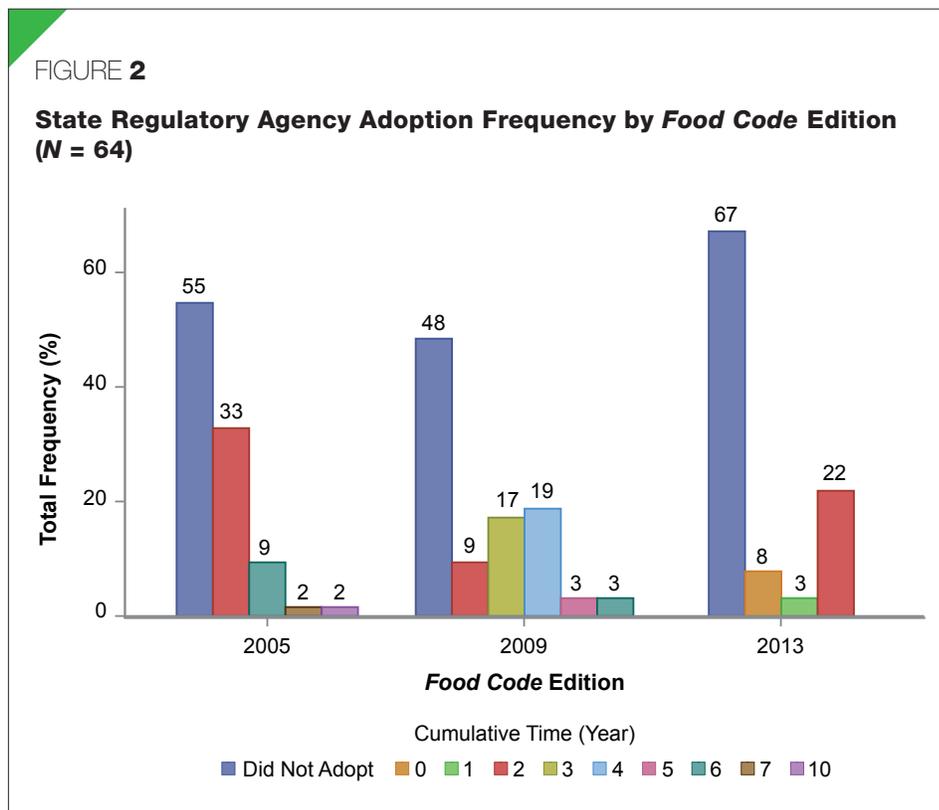


TABLE 2
Average Adoption Time of *Food Code* Editions Among State Regulatory Agencies Between 2005 and 2016

Edition	# of Agencies	Adoption Time (Years)		95% Confidence Interval (CI)
		Mean	Median	
2005 <i>Food Code</i>	29	3.28	2.00	2.43, 4.12
2009 <i>Food Code</i>	33	3.48	3.00	3.11, 3.86
2013 <i>Food Code</i>	21	1.43	2.00	1.03, 1.82

>8 years (older edition) from the publication of the current edition.

Given each agency DRE designation for the specific years investigated, we calculated an overall DRE frequency by dividing the proportion of agencies of a particular DRE designation (short, medium, or long) for a specific year by the total proportion (count) of agencies of all designations (short, medium, and long) in the same year multiplied by 100. For example, the overall frequency (%) of short DRE was the proportion (count) of agencies with a short DRE in a given year divided by the total proportion (count) of agencies of all

DRE designations (short, medium, and long) in the same year multiplied by 100.

Type of *Food Code* Adopter

The type of *Food Code* adopter, describing how up-to-date with the most recent edition of the *Food Code* an agency tends to be over time, was determined by rating the combination of DRE designations across 3 years (2008, 2013, and 2016). These 3 years were selected because they are the years (within the available data for the 6 years studied) that, at year end, a new edition of the *Food Code* became available. Designating the year available for

TABLE 3

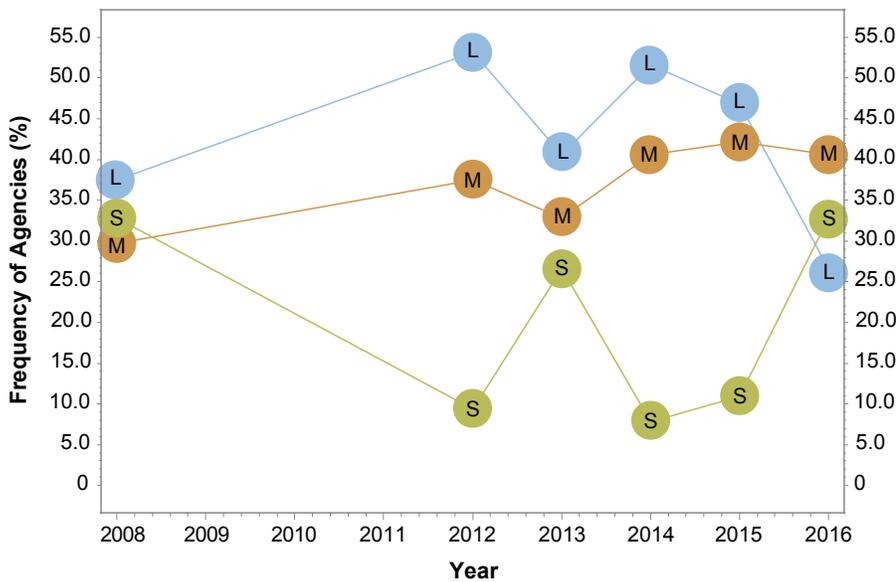
Cumulative Years Until Adoption of Food Code Editions by State Regulatory Agencies Between 2005 and 2016

Edition	Cumulative Years	Agency Abbreviation*
2005 Food Code	2	AL DPH, CT DCP, GA DPH, IL DPH, IA DIA, KS DOA, MD DHMH, MI DOA, MS DOA, MS DOH, NE DOA, ND DOH, OH DOA, OH DOH, RI DOH, UT DAF, UT DOH, VA DOH, WV DHHR, WI DOA, WY DOA
	6	AR DOH, CA DPH, NY DOA, PA DOA, VA DOA, WI DHS
	7–10	KY CHFS, NJ DHSS
2009 Food Code	2	DE DPHSS, MS DOH, NH DHHS, NC DPH, OK DOH, TN DOA
	3	AR DOH, CO DHE, FL DBPR, MI DOA, NE DOA, ND DOH, OH DOH, OR HA, VT DOH, WA DOH, WY DOA
	4	DC DOH, IA DIA, KS DOA, ME DHS, MO DHSS, NV DHHS, OH DOA, OR DOA, TN DOH, UT DAF, WI DOA, WI DHS
	5–6	FL DOA, HI DOH, ME DOA, MD DHMH
2013 Food Code	0	DE DPHSS, MS DOH, MT DHHS, PA DOA, SC DHEC
	1	NM ED, TX DSHS
	2	AL DPH, CT DCP, GA DOA, GA DOH, ID DHW, IL DPH, MS DOA, MO DHSS, NV DHHS, OK DOH, UT DAF, UT DOH, VA DOA, VA DOH

*See Figure 1 for a list of full agency names and corresponding abbreviations.

FIGURE 3

Frequency of a Short Versus Medium or Long Duration Since Adoption of the Most Recent Edition (DRE) Among State Regulatory Agencies Between 2008 and 2016 (N = 64)



S = short; M = medium; L = long.

adoption in the year following issue of a Food Code allows for consistency across the years studied. For example, the 2005 Food Code transitioned to the 2009 edition in 2010, the 2009 Food Code transitioned to the 2013 Food Code in 2014, and the 2013 Food Code transitioned to the 2017 edition in 2018. A current adopter (1) was an agency with a DRE designation of short two or more times across the three time periods. A moderate adopter (2) was an agency with a DRE designation of medium two or more times, or one short, one medium, and one long, across the three time periods. A late adopter (3) was an agency with a DRE designation of long two or more times across the three time periods. We calculated the percentage of each type of adopter by dividing the proportion of agencies of a particular adopter rating (1, 2, or 3) in a given year by the total proportion (count) of agencies in each rating category (1, 2, and 3) in the same year multiplied by 100.

Statistical Analysis

A one-way analysis of variance (ANOVA), Pearson chi-square, Cochran–Mantel–Haenszel test, and ordered logistic regression modeling were performed using SAS version 9.4 to test for differences in and between study variables and to determine associations between mode of adoption, DRE designation, and type of Food Code adopters. Tests of statistical significance were set at $p \leq .05$. In addition, given the mode of adoption, the odds (likelihood) of a DRE designation or type of Food Code adopter designation was compared.

Results

The mode of adoption is presented in Table 1. Of the 64 regulatory agencies studied (Figure 1), 40.62% (26) adopted the Food Code by reference while 59.38% (38) did not ($\chi^2 > 0.05$). Of those found to adopt-by-reference, 23 referenced a specific edition of the Food Code while three were found to adopt open-ended, meaning the agency adopts each new edition of the Food Code by reference automatically as it is released. These three agencies were the Georgia Department of Agriculture, Mississippi Department of Health, and Pennsylvania Department of Agriculture.

Not all agencies adopted each of the three editions of the Food Code when available as newer versions during the period of 2005–2016 (Figure 2). Among the regulatory agen-

cies studied ($N = 64$), approximately 55% (35), 48% (31), and 67% (43) did not adopt the 2005, 2009, and 2013 *Food Codes*, respectively, when released as newer versions (Figure 2). The time until adoption of the 2013 *Food Code* ranged from 0–2 years, the 2009 *Food Code* from 2–6 years, and the 2005 *Food Code* from 2–10 years (Figure 2).

For agencies that did adopt an edition of the *Food Code*, the average time until adoption was approximately 1.4 years for the 2013 *Food Code*, 3.5 years for the 2009 *Food Code*, and 3.3 years for the 2005 *Food Code* (Table 2). The cumulative time (years) for each agency to adopt the given edition of the *Food Code* between 2005 and 2016 is shown in Table 3. Among the agencies that adopted, the cumulative time until adoption decreased over time. Agencies that never adopted the 2005, 2009, or 2013 edition of the *Food Code* were not included in Table 3. These agencies were the Arizona Department of Health Services, Connecticut Department of Public Health, Florida Department of Health, Indiana State Department of Health, Louisiana Department of Health and Hospitals, Massachusetts Department of Public Health, Minnesota Department of Agriculture, Minnesota Department of Health, and South Dakota Department of Health.

Figure 3 shows the frequency (percentage) of the DRE designations (short, medium, and long) among the agencies ($N = 64$) in the 6 years studied. Compared with 2008, the percentage of a short DRE designation (current edition of the *Food Code*) was lower in 2012 (9.38%), 2013 (26.56%), 2014 (7.81%), and 2015 (10.94%), and was approximately the same in 2016 (32.81%) (Figure 3). The agencies were less likely to base their food safety regulations on a current (short) compared with recent (medium) or older (long) edition of the *Food Code* in 3 out of the 6 years studied (Table 4). Between the agencies, the odds of adopting a current edition were significantly lower in 2012, 2014, and 2015 compared with 2008 (Table 4). There was no difference, however, in the odds of adopting a current, recent, or older edition in 2013 and 2016 compared with 2008 (Table 4). Regarding the overall adoption rating, 15 agencies (23.44%) were assigned a designation of current adopter, 26 (40.63%) moderate adopter, and 23 (35.94%) late adopter (Table 5).

TABLE 4

State Regulatory Agency Odds of Adoption of Short Versus Medium or Long Duration Since Adoption of the Most Recent Edition (DRE) of the *Food Code*, 2012–2016*

DRE Designation by Year	Odds Ratio (OR)	95% Confidence Interval (CI)	p-Value
Short versus long (2012)	0.20	0.07, 0.58	.00
Short versus medium (2012)	0.23	0.08, 0.67	.01
Short versus long (2013)	0.75	0.32, 1.74	.50
Short versus medium (2013)	0.73	0.30, 1.79	.49
Short versus long (2014)	0.17	0.06, 0.53	.00
Short versus medium (2014)	0.17	0.06, 0.55	.00
Short versus long (2015)	0.27	0.10, 0.73	.01
Short versus medium (2015)	0.24	0.08, 0.66	.01
Short versus long (2016)	1.41	0.59, 3.36	.44
Short versus medium (2016)	0.73	0.31, 1.70	.47

Short = current; medium = recent; long = older.
*Year of comparison is 2008.

TABLE 5

State Regulatory Agency *Food Code* Adopter Rating ($N = 64$)

Adopter	# (%)	Agency Abbreviation*
Current (1)	15 (23.44)	AL DPH, DE DPHSS, GA DPH, IL DPH, MI DOA, MS DOA, MS DOH, NE DOA, ND DOH, OH DOH, OK DOH, UT DAF, UT DOH, VA DOH, WY DOA
Moderate (2)	26 (40.63)	AK DEC, AR DOH, CA DPH, CO DHE, FL DOA, FL DBPR, GA DOA, ID DHW, IA DIA, KS DOA, MD DHMH, NH DHHS, NY DOA, NC DPH, OH DOA, OR HA, PA DOA, RI DOH, TN DOA, TX DSHS, VT DOH, VA DOA, WA DOH, WV DHHR, WI DOA, WI DHS
Late (3)	23 (35.94)	AZ DHS, CT DCP, CT DPH, DC DOH, FL DOH, HI DOH, IN DOH, KY CHFS, LA DHH, ME DOA, ME DHS, MA DPH, MN DOA, MN DOH, MO DHSS, MT DHHS, NV DHHS, NJ DHSS, NM ED, OR DOA, SC DHEC, SD DOH, TN DOH

*See Figure 1 for a list of full agency names and corresponding abbreviations.

Mode of Adoption and DRE Designations

The general association between the mode of adoption and DRE designations (short versus medium or long) was significant (Table 6). Agencies that adopt-by-reference ($n = 156$) had a higher probability of adopting a short DRE (current edition) (25.64% versus 16.23%; $\chi^2 = 8.30$; $p < .05$) than agencies that adopt section-by-section (Table 6). Between the DRE designations, it appears that those agencies that adopt-by-reference

had a higher probability of a medium DRE (recent edition) (39.74%) than short DRE (current edition) (25.64%) or long DRE (older edition) (34.64%). Conversely, those agencies that adopted section-by-section had a higher probability of a long DRE (older edition) (48.25%) than a short (current edition) (16.23%) or medium (recent edition) DRE (35.53%) (Table 6).

The logistic regression model showed significant association between mode of adoption and odds of the DRE designations (Table

TABLE 6

State Regulatory Agency Mode of Adoption and Probability of a Short Versus Medium or Long Duration Since Adoption of the Most Recent Edition (DRE) of the *Food Code* During Study Period (N = 384)

Mode of Adoption	DRE Designation # (%)				Cochran–Mantel–Haenszel Statistics		
	Short	Medium	Long	Total	df	Value (χ^2)	Probability
Adopt-by-reference	40 (25.64)	62 (39.74)	54 (34.62)	156 (100)	2	8.30	0.01
Section-by-section	37 (16.23)	81 (35.53)	110 (48.25)	228 (100)			

Short = current; medium = recent; long = older.

TABLE 7

State Regulatory Agency Odds of a Short Versus Medium or Long Duration Since Adoption of the Most Recent Edition (DRE) by Adopt-by-Reference in 2016* (N = 384)

DRE Designation by Adopt-by-Reference	Odds Ratio (OR)	95% Confidence Interval (CI)	p-Value
Short versus long	4.36	1.67, 11.42	.00
Medium versus long	4.83	2.10, 11.09	.00
Short versus medium	0.90	0.30, 2.69	.86
Short versus long (at year = 2016)	8.63	1.72, 43.36	.01
Medium versus long (at year = 2016)	6.19	1.33, 28.81	.02
Short versus medium (at year = 2016)	1.40	0.31, 6.23	.66

Short = current; medium = recent; long = older.

*Year of comparison is 2008.

TABLE 8

State Regulatory Agency Odds of Being Rated a Current (Versus Late or Moderate) *Food Code* Adopter by Adopt-by-Reference During Study Period (N = 64)

Food Code Adopter	Odds Ratio (OR)	95% Confidence Interval (CI)	p-Value
Current versus late	3.32	0.82, 13.48	.09
Moderate versus late	2.75	0.78, 9.68	.12
Current versus moderate	1.21	0.32, 4.54	.78

7). Agencies that adopt-by-reference were more likely to be adopting a short DRE over long DRE (short DRE: odds ratio [OR] = 4.36, 95% confidence interval [CI] [1.67, 11.42], $p = .00$); however, the odds of adopting short

DRE were the same as medium DRE (short DRE: OR = 0.90, 95% CI [0.30, 2.69], $p = .86$). In the stratified analysis by year, in 2016 compared with 2008, among agencies that adopt-by-reference, we observed a similar

pattern for short DRE over long DRE (short DRE: OR = 8.63, 95% CI [1.72, 43.36], $p = .01$); the odds of short DRE over medium was also the same (short DRE: OR = 1.40, 95% CI [0.31, 6.23], $p = .66$) (Table 7).

Modes of Adoption and *Food Code* Adopter

The logistic regression model showed no significant difference in the odds of being a current, moderate, or late adopter, regardless of an agency's mode of adoption (current adopter: OR = 3.32, 95% CI [0.82, 13.48], $p = .09$) or (current adopter: OR = 1.21, 95% CI [0.32, 4.54], $p = .78$) (Table 8).

Discussion

More than 3,000 state, local, tribal, and territorial regulatory agencies have primary responsibility to regulate the more than 1 million food establishments in the U.S. (FDA, 2020b; Grossman, 2014). Frequent and timely adoption of the most recent edition of the *Food Code* by regulatory agencies signals a commitment to the use of current science-based interventions for the control of foodborne illness risk factors in retail and food service establishments (U.S. Department of Health and Human Services, 2013). The results of this study suggest a need for more frequent and timely adoption of each new edition of the *Food Code*. For agencies that adopted the 2005, 2009, or 2013 edition of the *Food Code* within the 4-year period of that edition's release, the average amount of time until adoption was approximately three years. This finding suggests timely adoption of the *Food Code* among those agencies that adopt an edition within the 4-year period of

the edition's release. Furthermore, this finding must be viewed in light of the results that show many agencies never adopted the 2005, 2009, or 2013 edition of the *Food Code* within the 4-year period of the edition's release. Failing to stay up-to-date with current editions of the *Food Code* can impede the implementation of up-to-date food safety interventions at retail and food service establishments, as well as impact regulatory agency eligibility for federal training, grants, cooperative agreements, and other federal resources (FDA, 2020a).

In general, agencies that adopt-by-reference adopted current (≤ 4 years from most recently published edition of the *Food Code*) and recent editions (> 4 years but ≤ 8 years from the publication of the current edition) of the *Food Code* while those that adopt section-by-section adopted older editions (> 8 years from the publication of the current edition). Regardless of an agency's mode of adoption, however, there was no difference in an agency being rated a current, moderate, or late adopter. While it was expected that less than one half of the agencies studied would adopt-by-reference, it was unexpected that only 3 of the 26 agencies (11.54%) found to adopt-by-reference did so in an open-ended manner and adopted each new edition of the *Food Code* by reference automatically as it was released.

The majority of agencies found to adopt-by-reference referenced a specific edition of the *Food Code* and were more likely to adopt a current or recent edition of the *Food Code* as compared with agencies that adopt sec-

tion-by-section. This finding suggests that agencies that adopt-by-reference have consistently kept their retail food regulations up-to-date with the current or recent edition of the *Food Code*. Identifying a specific edition being incorporated by reference adds specificity; however, Bremer (2013) notes that such specificity also creates challenges for agencies to keep their regulations current with revisions made to "reflect evolving technical knowledge." Continued efforts are needed to move agencies that adopt section-by-section to adopt recent or current codes. Likewise, efforts should be made to support agencies that adopt-by-reference to improve timely adoption of current editions of the *Food Code*.

Limitations to this study include lack of a specific date within a given publication year that a new edition of the *Food Code* is made available, as well as a lack of data for years 2009, 2010, or 2011. These limitations potentially reduced the power of the model to detect significant trends in *Food Code* adoption in 2016 compared with 2008. Due to the repeated observations in this study design, however, this longitudinal study provides explanatory advantages over a cross-sectional design.

Conclusion

This study found a significant relationship between mode of *Food Code* adoption and frequency of *Food Code* adoption over time. In general, agencies that adopt-by-reference adopted current and recent editions, while agencies that adopt section-by-section

adopted older editions. A possible explanation for variations in timely adoption by agencies given their modes of adoption might be due to differences that exist in the rules, procedures, authority, and legislative cycles within jurisdictions, as well as state legislative professionalism, dominant norms, and values (Dilger, Krause, & Moffett, 1995; Squire, 2007). Therefore, future studies should explore the impact of legislative professionalism on the relationships between mode of adoption and adoption frequency. Future studies should incorporate a more robust sampling design, taking into account the difference between year of adoption and effective date, and consider potential changes in mode of adoption within the study period. Perhaps, when considered together, these factors could provide further insight into the similarities and differences in state agency adoption frequency. By understanding the variables that affect *Food Code* adoption, more targeted efforts and resources can be leveraged to assist jurisdictions with maintaining up-to-date food safety controls within their retail food regulations. 🚗

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September is National Food Safety Month. NEHA is currently planning multiple activities and resources to support the observance and highlight the importance of food safety, including webinars, blog posts, and more. Please stay tuned at www.neha.org for more information.



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