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Food Cultures, Total Diet Studies and Risk Management: Implications for Global Food Policy and Public Health

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**FOOD CULTURES, TOTAL DIET STUDIES AND RISK MANAGEMENT:
IMPLICATIONS FOR GLOBAL FOOD POLICY AND PUBLIC HEALTH**

A Thesis Presented

by

LAURA ANNE PILLSBURY

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Food Science Policy

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*When one does not see what one does not see,
one does not even see that one is blind.
-Paul Veyne*

ABSTRACT

FOOD CULTURES, TOTAL DIET STUDIES AND RISK MANAGEMENT: IMPLICATIONS FOR GLOBAL FOOD POLICY AND PUBLIC HEALTH

MAY 2008

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Globalization, urbanization, and industrialization are continuously altering the increasingly complex relationship between humans and food. At any given time, food can raise issues regarding diet and health, risk and safety, ethics and morality, or governance and power. Universally, what we eat and how we eat it is a fundamental expression of cultural values and social relationships. Yet, the prestige given to science and risk analysis in policy justification has led to modern food policies that fail to fully grasp the multiple dimensions of food and the multiple scales of policy (i.e., local to global). This study specifically examines characteristics of the network that shapes risk assessment data collection methodologies. As minor as these methodologies may seem in the global scheme, the evidence they collect ultimately guides the policy discourse.

Approaching this analysis from an interpretive perspective, various social science methods are used to illustrate the linkages, interactions and power relations between national and international actors involved in a specific methodology – the total diet study (TDS). This research is designed to understand the influence of the TDS international collective knowledge network on how cultural and ethnic diversity in food preparation

and consumption is recognized, understood and integrated into food safety research methodologies, national and global food policy, and food safety guidelines or standards.

By investigating the influence of policy institutions, management structures, and ideological frameworks on the design and implementation of TDS programs, this thesis reveals the constrained scope of expertise codifying the disregard for socio-cultural diversities of food preparation and consumption. The findings demonstrate the strong emphasis on positivist philosophies and scientific methodologies; however, vast knowledge of the socio-cultural determinants of health and food habits support the need to complement objective data with social and cultural data to fill in the gaps. A review of innovative TDS practices and the emergence of rigorous qualitative software tools demonstrate that the demand for empirical data does not have to come at the expense of the health and livelihood of ethnic subgroups. Further research on the costs associated with these alternative projects is necessary to determine their mainstream feasibility.

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PREFACE

Nutrition is a field in which enough scientific knowledge has been accumulated so that the well-being of mankind can be enormously enhanced by its application. The goal of better nutrition for the peoples of the world is one upon which nations and groups which differ in many other ways can agree and toward which they can work. The effort to reach this goal can be implemented only by bringing to bear all of our scientific knowledge, that of human cultures as well as of the human body, that of human attitudes toward food as well as of the chemistry of the food itself.

(Guthe, C.E., 1945, p. 5)

The unit of behavior for a study of food habits is not the food, expressed in terms of international units or specific units, nor the human being exercising will power in making proper or improper choices, nor the amount of wages available per family per month. It is a *given human being* (whose whole behavior has been modified by his social experience) *consuming a given item of food* (the constitution of which has often been modified by human means) *at a given place* (where the availability and quality of the food will have been determined partly by local geographical conditions and partly by man-made improvements that will include the import of materials such as fertilizer or new types of seed, or the import of foodstuffs from another locality) *at a given period in history* (with the climatic and social conditions characteristic of that period).

(National Research Council, 1945, p. 25)

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LIST OF ACROYNMNS

| | |
|-----------|---|
| CAC | Codex Alimentarius Commission |
| ECOSOC | United Nations Economic and Social Council |
| FAO | Food and Agriculture Organization of the UN |
| FDA | U.S. Food and Drug Administration |
| GEMS/Food | WHO Global Environment Monitoring System – Food Contamination Monitoring and Assessment Program |
| INPPAZ | Pan American Institute for Food Safety & Zoonoses (PAHO-WHO) |
| IOM | Institute of Medicine, National Academy of Sciences |
| JEFCA | Joint FAO/WHO Expert Committee on Food Additives |
| JEMRA | Joint FAO/WHO Expert Meetings on Microbiological Risk Assessment |
| JMPR | Joint FAO/WHO Meetings on Pesticide Residues |
| SPS | Sanitary and Phytosanitary Agreement (WTO) |
| TDS | Total Diet Study |
| USDA | U. S. Department of Agriculture |
| USEPA | U.S. Environmental Protection Agency |
| WHO | World Health Organization |
| WTO | World Trade Organization |

CHAPTER 1

INTRODUCTION AND ANALYTICAL FRAMEWORK

This thesis is the product of using a research process and methodology that took me beyond the boundaries of any scientific study I have done before. The manner in which this research idea has been created, explored, carried out, redefined, analyzed, reflected upon, and re-synthesized can only be called non-linear. The multiple threads of the research parallel the links between actors in the global village in which we live and interact. Humans are more closely interconnected than ever before, and I believe it is my obligation as both a student of food science and public policy to acknowledge this in my research question, data collection, and analysis and to report it in my findings.

This is written from a theoretical and methodological perspective rooted in a model of action research and further elaborated through interpretive and ethnographic analyses adapted from the work of Clifford Geertz, Margaret Mead, and more recently, Frank Fisher, Deborah Stone, and Dvora Yanow. These scholars and many more challenge mainstream positivism through the exploration of knowledge, meaning, actions, and discourse (Geertz, 1973; Douglas, 1982; Fischer, 2003; Stone, 2002; Yanow, 1996, 2000). My research design neither follows a pre-planned linear structure nor does it establish a set of hypotheses to be tested and proven or rejected; rather my research is a form of merging knowledge and insights that continue to develop even as I write this. New questions constantly surface about how the governance of the global food system can be better understood and how it could be structured in the future, all with respect to

determining how to rigorously and scientifically integrate objective and quantitative data with subjective, symbolic, and qualitative contextual evidence.

This research can be viewed as an epistemological offering that illuminates the advancement in social science research tools that can complement data used in the risk analysis process while also more sufficiently addressing the complexity and socio-cultural context of the global food system. My intention is to synthesize the rich heterogeneous information about food cultures, nutrition, food safety, and the use of a traditionally proscribed method as a way to increase reader awareness of the powerful impact of the socio-cultural aspects of food ingestion practices on national and global food policies.

This opening chapter presents the overarching theoretical and analytic framework of the thesis. The following two sections briefly highlight the disconnect between the theoretical frame and paradigms reinforcing the food policy domain and the social context within which food is produced, processed, regulated, prepared, and consumed. I first trace the emergence of the integrated global food system that guides the current multi-level processes and relationships in which decisions are made, technology advances, organizations change, and people eat. This discussion is then linked to the evolution of analytic methods that are used to understand food, which are no longer closely aligned with or capable of adapting to the rapidly increasing interconnectedness of the global food system. The chapter concludes with a description of the research design and an overview of the subsequent chapters.

The Evolution of the Global Food System

Food is the most fundamental of material substances, yet is also subject to the greatest degree of cultural alteration. Over the past century, local, regional, and national food systems have undergone a massive transformation associated with the global movement of people from rural to urban settings and the industrialization of production methods. Dietary patterns are converging worldwide driven by income and globalization of the food industry (Frazão, Meade, & Regmi, 2008). The consolidation and internationalization of the global food system have more deeply entwined the actors and linkages along the farm-to-fork or dirt-to-dish continuum. Decisions by actors along the continuum – producers, multi-national corporations, governments, marketers, international organizations, research institutions, and consumers – influence everything from crop production and distribution to product composition and packaging. New technological advancements and cooking methods influence preparation while new social constructs influence preferences and ingestion. The analysis of diverse cultural parameters allows us to explore why we eat what we eat and why we eat it in a certain way. Understanding this totality at both an individual and societal level - an amalgamation of foodways - enables us to examine societal change through the lens of food. Despite the convergence of dietary habits, traditional dietary patterns that differ by geography, culture, and lifestyle persist. The social, economic, historical, and cultural factors should enable a greater understanding of how different dietary customs can improve or harm human health and nutrition, which is too often bounded by the well-defined parameters of biochemical science.

The food system has historically been explained and diagrammed as a food supply chain like the simplified version in Figure 1.1. Food policymaking shapes the primary activities in this perspective through the establishment of commodity titles and farm subsidy programs, regulations and guidelines on production and processing, quality and safety standards on final products, guidelines and recommendations on what to eat, government redistribution and transfer programs, and inspection programs for processing facilities and restaurants (specific examples are also displayed in Figure 1.1). However, this framework does not capture some key characteristics, such as the temporal and spatial scale within which the actors and processes are embedded and interact.

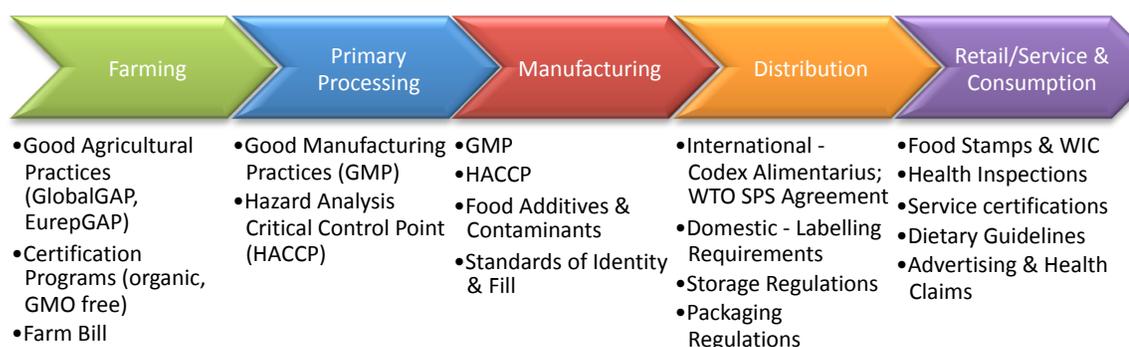


Figure 1.1. A generalized version of activities in the food supply chain and applicable policies (mandatory and voluntary).

(Source: author's version)

Approaching food and nutrition issues and the implications of related policies from the framework of an integrated system illuminates the structures, inputs, mechanisms, actors, and the actors' functions so that the system may be more thoroughly understood as the sum of all its parts. This research project relies on a more comprehensive multi-scale framework: one that is complex and includes the

interdependencies among the many expressions of food (Figure 1.2). This more holistic approach allows the researcher to highlight the connectivity between actors and processes that span across the traditional structure in Figure 1.1. It also recognizes that actors are involved in these elements at different levels, including the individual, group or communal, organizational, or institutional level. Thus this approach more thoroughly distinguishes the variation in both the actors' perceptions and the patterns of interaction and knowledge as shaped by the level and type of participation. Further, each local, regional, and national food system overlaps to form an integrated global food system that is deeply intertwined with development of the global economy and global society.

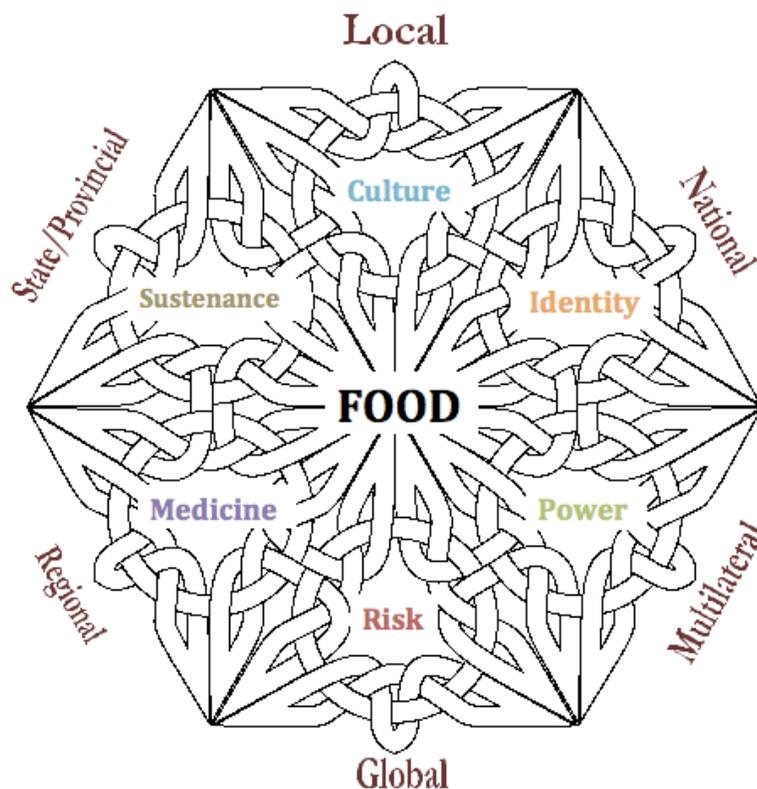


Figure 1.2. A multi-scale, multifaceted representation of the food system.

(Source: Author's version, adapted from a Celtic knot clip art image)

These increasing interdependencies across levels make it important to understand the professional obligations and responsibilities that are associated with such a complex system. Do the experts involved in the analysis and governance of the food system effectively grasp the complexities?

The Evolution of Macro and Micro Analyses of Food

Paradigms, theories, and ideologies that guide how one views the world go through periods of dominance and periods of revolutionary changes (Kuhn, 1970). Of particular interest to Kuhn were the necessary elements that led to these paradigm shifts. What determined why a previously accepted framework would be abandoned while another prevailed in its place? The food domain has gone through such transitions as it moves between macro (multidimensional, including historical, cultural, and social elements) and micro (linear, molecular level) analyses. During World War II, Margaret Mead and the Committee on Food Habits released the *Manual for the Study of Food Habits* (1945) with intent to demonstrate how the social sciences could be integrated with nutritional sciences to look at the issues associated with change, particularly the social changes that were being directed by technological change. In a 1964 follow-up report, Mead noticed that many of the methodologies proposed in the 1940s were largely overlooked in the aftermath of the war, but renewed interest in the behavioral sciences was reemerging. In the same time period, the Human Relations Area Files (HRAF) was created as a research network that would work to establish a large mass of centrally located information on hundreds of different cultural, ethnic, religious and national

groups across the world to contribute to the understanding of world cultures and encourage cross-cultural research (HRAF, n.d.).

While Mead was leading the exploration of methodologies that would capture the elements of human life as they related to food habits, McCance and Widdowson were working on the development of food composition tables that were first compiled in 1878 (Williamson & Buttriss, 2007). In contrast to Mead, they were trying to understand the role of the chemical composition of foods in health and disease, now more formerly referred to as nutrition epidemiology. Research fields like nutritional science and epidemiology tend to be primarily oriented at the micro-level, analyzing the molecular and biochemical effects of individual nutrients on human health.

It is common for the objective and “factual” approaches to science to develop faster than the less tangible social and cultural dimensions, due partly to the promising benefits as well as the distribution of monies to fund various aspects of the research. The notion that scientific thinking will lead to generalizable “truths” tends to reify the assumption that only rational aspects of action are worth studying, and thus, neglecting the less rational expressions of emotion, feelings, beliefs and values (Yanow, 1996). Nanotechnology is a contemporary example of how funding is disproportionately divided among this supposed dichotomy, dedicating the majority of funds to the development of the technology itself, with minimal support for the examination of ethical and social implications of the new technology on various population groups (R. Sandler, personal communication, March 31, 2008).

Developments in physical and biological science methodologies during the 1960s and 1970s allowed scientists to zoom in and see the object under analysis at the

molecular and atomic level – and now at the nanoscale - leading to further discoveries of universal laws and the perceived ability to explain, predict, and control the world. The idea that theories and knowledge could only be proven through the scientific method implemented by an impartial observer (i.e., positivist philosophy) became a norm and nudged the extension of its methodological rigor into the realm of social sciences (Yanow, 1996). The physical world and social world sought two different methodological goals: the physical sciences sought to explain universals and the social sciences endeavored to understand variability. The interpretive theory challenges this notion on the basis that human beings make, communicate, share, and interpret meanings and actions created by themselves or others in order to understand their surrounding world. Thus, as Yanow observes, "... we need a human science that can help us understand ... the actions and interactions and intentions of others, understand ourselves in organizations and societies, question the production of knowledge and the nature of that knowledge" (1996, p. 5). This is especially true for the public policy domain since it encompasses the ideological systems, social institutions, motivations, actions, and interactions that guide perceptions and behavior.

This bounded attention at the microscopic level was revealed in an analysis of the government data on U.S. food consumption trends, which showed that the majority of the results are presented in terms of specific nutrients consumed. This is a stark finding with respect to the observations of Trichopoulou et al. (2007): "Diet, however, is multidimensional and shaped by various factors, including physiological, agricultural, historical, religious, socioeconomic and psychological ones" (as cited by Gedrich, 2003). Fortunately, several efforts to re-expand the study of dietary patterns and to recognize the

complexity and multidimensionality of human food consumption patterns with respect to health and well-being are beginning to emerge. One example is the European Food Information Resource Network (EuroFIR) which has a dedicated scientific working group to establish a definition of traditional foods and compile analytical nutritional data on these foods for inclusion in national food composition databases (Trichopoulou, Soukara, & Vasilopoulou, 2007). Additionally, the national food safety agency in the UK announced last year that it is creating an overarching General Advisory Committee on Science, which finally includes social scientists in its membership (Wadge, 2007). In April 2008, the agency also established a Social Science Research Committee to “strengthen its capacity for social science research” and provide guidance on how to collect and use social science data as evidence in policymaking (FSA, 2008, para. 1). With advances in information technology and design, new tools in social software and visual analytics are transpiring and allowing researchers to complement the micro with the macro to systematically collect and analyze data from a multi-dimensional framework.

In this research I am building on the foundations of data, evidence and information that has been compiled before, but sadly overlooked. The reemphasis on the socio-cultural perspective is designed to both recognize the importance of fields relating to nutrition and food science while placing that perspective back within the social and cultural context from which the research on food consumption habits are derived. If this contextual information is excluded from the analysis, then there is the potential to overlook or fail to foresee important socio-cultural impacts and the long-term cost-benefit implications of policies and risk management measures that are shaped by the presently

limited scope of dietary assessments. As now there is more cognizance of the need to systematically integrate cultural data into research processes, this thesis seeks to demonstrate the need for a multidisciplinary frame to inform elements of risk analysis and policymaking.

Research Design

This total dietary study research question explores the management of an emerging integrated global food system by examining the topology of food safety risk assessments, particularly exposure assessments of chemical contaminants in the food supply through the international Total Diet Study (TDS) program. Literature on the history of TDS in the United States acknowledges the current lack of understanding around how an integrated socio-cultural perspective could be used to inform “commonly consumed” TDS foods. Specifically, only a few discussions address the implications and unintended consequences that result from the international use of a methodology that focuses on only a single dimension of food intake, that is, the “objective” biochemical nutrient values of food.

My research focuses on the relationship of data collection, risk assessment, and monitoring programs (i.e., total diet studies) to how the data are analyzed and transformed into analytic evidence and information used as a basis for national and international food safety and nutrition policies, guidelines, or standards.

The fundamental question asked by this research is,

What is the influence or impact of existing policymaking institutions, dominating discourses, and other governance and management structures on how cultural and ethnic diversity in food preparation and consumption is recognized, understood and integrated into food safety research methodologies, national and global food policy and food safety guidelines?

Working from an analytic framework which emphasizes interpretative policy analysis, ethical principles, and the history of methodologies and ideologies in this field, I focus on how a dominant scientific paradigm and the particular measurement tools used to capture food consumption patterns and risk assessment data may not be capable of adequately addressing the increased complexity of the global food system. Such complexity is evident in the expansion of global food governance mechanisms, such as Codex Alimentarius (herein called Codex for short) and global standards setting.

Qualitative methodological triangulation, including open-ended interviews, an online survey, social network mapping, and document collection, was used to gather data for this study.

Survey Design

The patterns and findings that emerged from preliminary document analysis and conversational key informant interviews directed me towards conducting a survey to obtain a broad comparison of national TDS programs. Participants selected for the online survey comprise the most recently active population of global experts who are involved with TDS activities, specifically those who participated in the Fourth International Workshop and Training Course on Total Diet Studies in Beijing (WHO, 2006a). This population served as my interpretive community, capturing both centrally located

international agency officials at WHO and FAO and field-based experts involved with TDS in their respective countries. Fifty-eight individuals were invited to participate, twenty-two responded and twelve were unable to participate for various reasons; thus, the response rate was 47. 8 percent.

The online survey was created from a survey guide (refer to Appendix A) consisting of nine open-ended questions and operated through SurveyMonkey.com. Table 1.1 details the overarching topics I sought to cover with the survey of scientists and agency officials.

Table 1. 1 Objectives for survey of TDS experts

| Topic | Objectives |
|-----------------------------|--|
| Demographics | <ul style="list-style-type: none"> ▪ <i>Individual</i>: an actor’s background and training, experience, and role in TDS ▪ <i>Organizational</i>: primary groups/departments that have a role in the TDS process |
| Policy (vision & objective) | <ul style="list-style-type: none"> ▪ The individual’s own perspective of the value of TDS ▪ How and who uses the outputs |
| Process (management) | <ul style="list-style-type: none"> ▪ Internal, national, and international knowledge networks ▪ Coordination across actors, organizations, and nations |
| Procedure (tools & methods) | <ul style="list-style-type: none"> ▪ Food consumption survey methods and other data collection processes (and the reasoning behind them) ▪ How core foods are determined and what (or who) dictates changes in the list ▪ Data presentation and public engagement |

Methods of Analysis

I employed discourse and thematic analyses of the open-ended survey responses, interview notes, agency documents, and peer-reviewed publications of TDS results. A combination of manual sorting, qualitative coding software (TAMS Analyzer), and Internet-based content analysis tools was used to conduct the analyses. Particular emphasis was given to technical knowledge (e.g., highly specialized language and very detailed explanations of the procedure), process knowledge (e.g., transnational coordination, interaction, and relationships), and interpretive knowledge (e.g., subjective explanations of benefits, beliefs, and meanings). A social network analysis was also done to complement the examination of the creation of meaning and perceptions through language by illuminating the interactions among this group of experts and the larger network of food safety agency officials and researchers. UCINET Social Network Analysis Software was used to do basic network statistics and network visualization. Since there is not a fixed roster of the global TDS network, participants were asked to list domestic and international TDS colleagues with whom they communicate and coordinate. The network generated by compiling the responses therefore represents egocentric network data, that is network data that is based on the aggregation of individual, independent responses. More on the visualization and interpretation of the network can be found in Chapter 3.

The purpose of my research is not to provide a transferable model or set of generalizable conclusions, but rather my goal is to provide policymakers with different but necessary questions and new tools that can be used to capture the interpretative nature

of food policies and more accurately reflect the normative behavior and social institutions that develop food safety risk assessments.

Overview

This introductory chapter establishes the theoretical frame, research design, and methodology used to answer the fundamental research question and generate a sample of questions that can be used by policymakers to address the social context into which the global food system is rapidly transforming. The following chapter, Chapter 2, presents background material on total diet studies and how the TDS data are used at both the national and international levels of policymaking. It also elaborates their contribution to the global food standards setting process (Codex Alimentarius) and how individual countries perceive the greatest value of TDS to their respective populations. Chapter 3 then addresses the questions of “who’s power,” “what knowledge,” and “which food” by examining the transnational network of scientists and experts who are most active in the support and discussions on TDS and how the TDS foods are determined. This information is used to illuminate how the norms and assumptions that persist in the TDS network can perpetuate the negation of the ethical dimensions of food, thus disregarding social accountability to the public. Further, the lack of coordination between scientific expert knowledge and local knowledge fails to foster the use of science as a basis for transparent collaboration, and ultimately a more equitable food system. The concluding chapter outlines current examples of how cultural and ethnic diversity are currently incorporated into various research initiatives, data collection methods, and food composition databases. It also includes proposed changes that could be made to the

governance mechanisms and institutions in order to mitigate the privilege that is currently placed on data quality and objectiveness at the expense of the complexities of consumption.

CHAPTER 2
CHEMICAL CONTAMINANTS, TOTAL DIET STUDIES & RISK
ASSESSMENT

Chemicals are ubiquitous in the environment and, thus, can unintentionally or deliberately enter the food supply at nearly any point in the food chain – from production, to processing, to preparation. Chemical contaminants pose significant human health risks when exposure exceeds safety thresholds and have been linked to a myriad of health conditions, including cancer, kidney or liver dysfunction, birth defects, reproductive disorders, learning disabilities, and impeded development (WHO, 2006b). Exposure and susceptibility to chemical contaminants is often connected to a number of variables including time and space, age, food consumption patterns, and cultural traditions.

For example, in discussions on how to reduce exposure to dioxins and dioxin-like compounds, an expert panel of the Institute of Medicine (2003) showed concern for certain subgroups of the population that are at higher risk because of cultural or behavioral norms that increase exposure. Since dioxins accumulate in fatty tissues, animal fats are believed to be the main human exposure pathway. The availability of various types of data helped the panel recognize that subsistence fishers and American Indian and Alaska Native tribes that tend to consume large amounts of fish and game require special attention when identifying policy or risk management options. Further, dioxins enter the food supply through animal production systems, so levels of exposure tend to primarily vary by geographic region (IOM, 2003). Other chemical contaminants of concern, such as acrylamide and heterocyclic amines, are formed during the heating

process, and thus, exposure levels are largely dependent on how the food is prepared by individual consumers. Mature TDS programs, which exist only in high-income countries¹, stratify food sampling plans by geographic region and season to account for some variability across time and space. The next section describes the objectives of total diet studies in more detail.

What Are Total Diet Studies?

The main purpose of total diet studies is to protect diets from chemical contaminants by monitoring exposure levels of the general population over time (WHO, 2006b). At the global level, the Global Environment Monitoring System – Food Contamination Monitoring & Assessment Programme (GEMS/Food) of WHO supports the Total Diet Study program as a primary and cost-effective mechanism to monitor and assess human exposure to chemical contaminants in the diet. The organization encourages all countries to undertake total diet studies as the most consistent and relevant method of food analysis in order to acquire contamination data that are directly comparable with WHO reference levels (e.g., ADI, acceptable daily intake and PTWI, provisional tolerable daily intake) for contaminants that may accumulate in the body.

According to the WHO,

A total diet study consists of purchasing at retail level foods commonly consumed, processing them as for consumption, often combining the foods into food composites or aggregates, homogenizing them, and analyzing them for toxic chemicals and certain nutrients (2006b).

¹ I define “mature” programs here as those that have existed for 20 years or more and are conducting the survey on a regular basis (refer to Table 3.1).

In just this one sentence significant cultural assumptions are at play, particularly the definitions of “commonly consumed” and “processing them as for consumption.” Numerous cultural and methodological questions arise: Who defines “common”? In culturally diverse societies, what is “common”? How are non-mainstream diets, such as vegetarianism or those of indigenous peoples studied? How are different preparation methods for similar foods taken into consideration? A simple example helps identify the cultural assumptions. Assume grilled meat is considered a “commonly consumed” food that is analyzed in a total diet study. We know that different cultures roast and cook meat over fires of different heat magnitudes, for different amounts of times, often mixed with other herbs, vegetables or spices. How are different grilling methods and heat sources (e.g., coals, woods, propane) be taken into consideration? How does the researcher know the precise temperature and time it takes to be cooked “as for consumption” prior to analysis? If the meat is cooked too long and too hot, carcinogen heterocyclic amines are more likely to form and the resulting exposure estimates would be elevated. However, if it is only cooked to medium rare, the associated risk might be underestimated. Risk assessments may always be fraught with uncertainty and the fundamental question of which way to err, but a social analysis of grilling techniques would provide more evidence to justify the decision.

Since the current methodology is stuck at the molecular level of how nutrients and elements interact in the body, the deeper socio-cultural analysis is virtually forgotten. While the cultural assumptions mentioned earlier are incorporated into “scientific” representations of food consumption and risk, in reality, they are a reflection of a dominant, majoritarian food consumption pattern (i.e., the “national” diet) that protects

the “average eater” but says little about cultural subsystems. To fully understand the implications of this limited understanding, it is important to recognize the uses of the information gathered from total diet studies.

How Are TDS Results Used?

Total diet studies are primarily portrayed as instruments for monitoring public health, but they do carry significant weight in the development of international standards for trade and environmental management.

The International Level: Risk Analysis & Codex Alimentarius

The World Trade Organization introduced the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) in 1995, which recognized the standards and guidelines approved by the Codex Alimentarius Commission (CAC, see Figure 2.1 for a high-level representation of the Codex global standards setting process) as a consensus on health and food safety requirements within the international community. The SPS Agreement set the bar for the justification of global policies using objective scientific evidence by becoming the first international treaty to establish risk assessment requirements (Pillsbury, 2008) and the adoption of the risk analysis paradigm. The three elements of risk analysis - risk assessment, risk management, and risk communication - provide the regulatory context in which TDS programs are performed. However, total diet studies are just one of many tools utilized to inform Codex decisions.

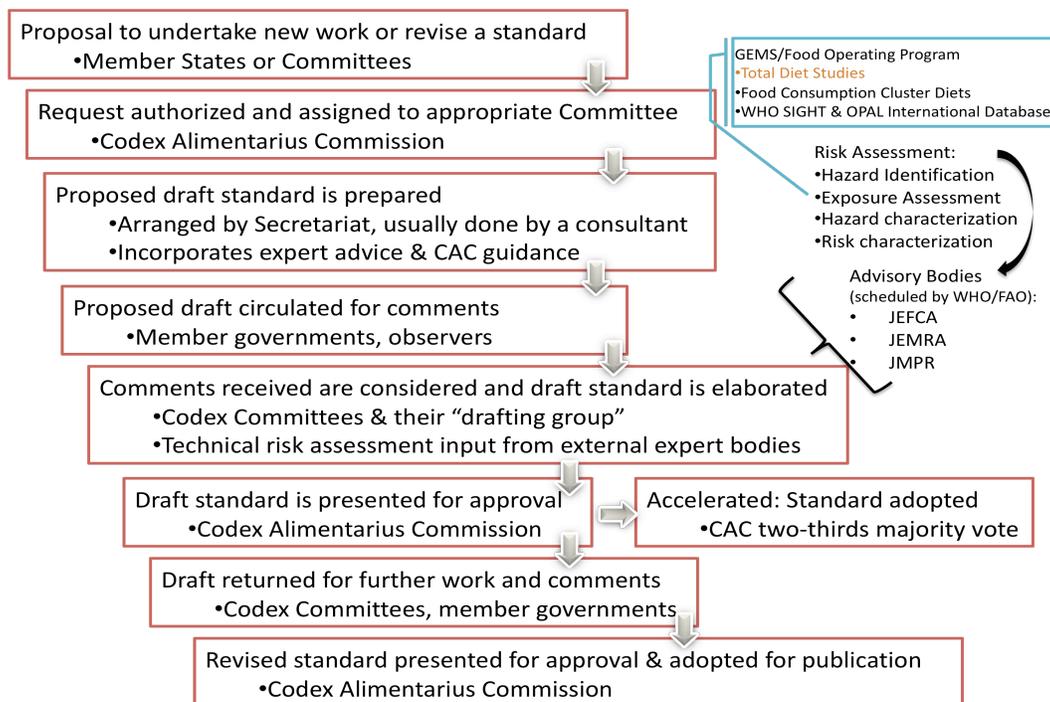


Figure 2.1. Total Diet Studies in relation to the Codex Alimentarius standards setting process and actors involved.

(Source: author's version adapted from the CAC Procedural Manual, 17th ed.)

The WHO GEMS/Food Programme provides data from TDS on the dietary exposure to contaminants to Codex Committees and advisory bodies, such as the Joint FAO/WHO Expert Committee on Food Additives (JEFCFA) and the Joint FAO/WHO Meetings on Pesticide Residues (JMPR). These advisory bodies collect data for the four components of risk assessment: hazard identification, hazard characterization, exposure assessment, and risk characterization. TDS exposure estimates are regarded as the most accurate information on dietary exposure of the total population to chemical hazards in the food supply, and thus, carry significant weight in the risk assessment process when adequate global data is available. Adequate global data are certainly dependent on adequate national data, which are dependent on adequate food consumption data.

Understanding the embeddedness of these data collection processes is vital to critically assessing the adequacy of the policy, standard, or risk management measure in the protection of public health for the entire population since they should be based on the outcome of the risk assessment. TDS also has a role in risk management since they provide a mechanism to evaluate the effectiveness of risk management measures. Since TDS are also thought to provide the most realistic assessment of dietary exposure in relation to other food analysis methods, they are considered helpful for appropriately targeting risk communication strategies.

The National Level: Risk Assessment & Risk Communication

Since the responsibility to monitor public health outcomes related to the food supply currently rests with national health authorities, methodologies and uses of total diet studies vary by country. Figure 2.2 shows the primary values that survey respondents felt a national total diet study provides for their country. From this representation, it is clear that despite the variability in methods, there is a general agreement that the “representativeness” and “authenticity”² of the data gathered are perceived as key values of conducting a TDS for nearly all countries.

² Representativeness and authenticity in the sense that the data capture both the foods as they are consumed and allow for exposure estimation for the whole population.

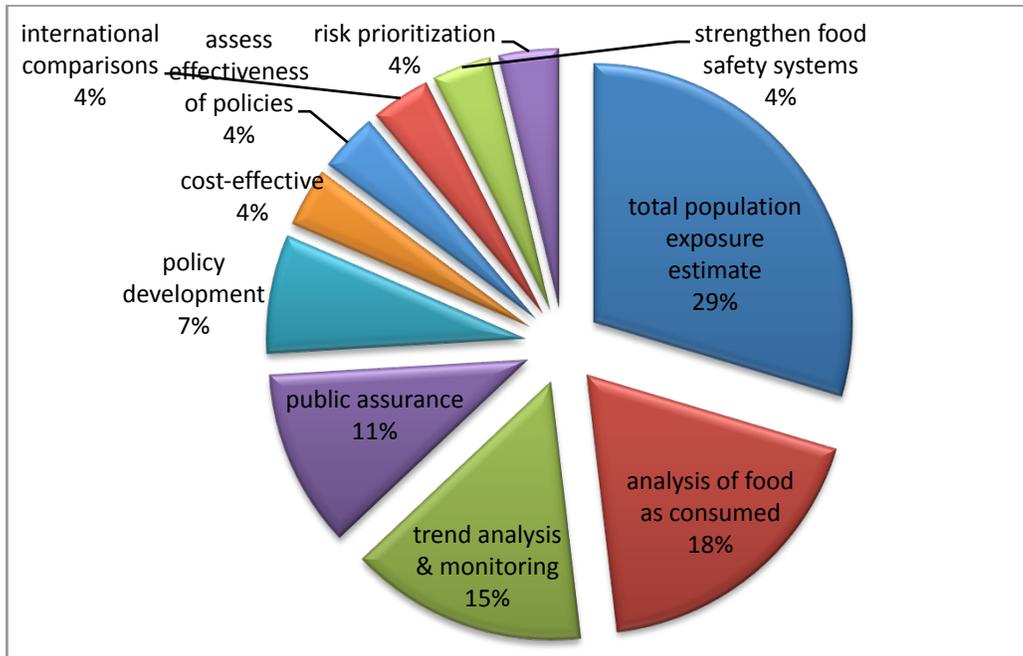


Figure 2.2. Online survey responses to what participating TDS experts (n=22) perceive as the value a national total diet study provides to their country.

(Source: author's figure; question was open-ended so some respondents provided more than one answer and others from countries without TDS programs chose not to respond to this question)

Although policy development, support, and management are not as highly valued according to the survey responses, the literature and policy records demonstrate how the statistically sound data are fed into the formulation and evaluation of policies through the risk analysis framework. Risk managers, government regulatory officials, and expert panels at the national and international levels use the data to consider whether standard limits are adequate to protect the population of their country and what is globally acceptable. Countries that conduct total diet studies routinely are also able to analyze trends of exposure levels and how those may change with respect to changes in food consumption patterns. Additionally, longitudinal data are used to assess the impact of risk management decisions and risk communication strategies. Risk communication can be

complex because individual perceptions of risk, which are shaped by the role of social elements like culture, trust, and affect, may vary widely from the assessment of experts.

At a point in time when consumer confidence in the safety of the food system is down, the recognition of public assurance as an important value poses critical questions about accountability and transparency with regards to total diet studies and other data collection methodologies. According to one informant, TDS assessments can be used to “reassure our public, politicians and regulators.” If handled appropriately, this reassurance has the potential to be quite advantageous given the current context and variations in the public perception of risk acceptability. According to a recent survey of 500 U.S. consumers by the Leopold Center for Sustainable Agriculture at Iowa State University, 70 percent of Americans perceive the U.S. food system to be safe; however, only 12 percent feel the global food system is somewhat to very safe (Pirog & Larson 2007). The questions being asked in this study though seem to generate even more questions about accountability to the public and whether the assumptions made are transparent and provide enough information such that the public is actually reassured. If TDS data were more widely presented to the public, would citizens really feel confident about the safety of the food supply if the foods they commonly consume were not the same as those analyzed? Further, does the diminishing confidence in globally sourced food necessitate a more thorough look at where the analyzed food comes from?³

The variety of ways in which TDS data are used establishes the significance of the total diet study as a monitor of the food supply and acknowledges its effectiveness in prioritizing risks given limited resources. We now need to go beyond and replace the

³ Food identifiers, such as brand name or country of origin, are not currently a factor in the acquisition of food samples.

important cultural and social dimensions currently removed from the TDS methodologies in use, which will more closely align the outcomes of TDS with its intentions. For a program that from the surface appears to be fairly removed from the political process and heavily based on empirical certainties, analyzing the management and communication of the TDS process leads the research deeper into the issues of politics and power.

CHAPTER 3

IMPLICATIONS FOR POLICY, GOVERNANCE, AND PEOPLE

The policymaking sphere can sometimes present a double-edged sword, as decisions of action and inaction can both constitute public policies. By turning a blind eye to the social and culture context through which food habits are filtered, a lack of recognition of the importance of diversity is essentially being codified. Similarly, the lack of public participation and the privilege given to strictly objective data becomes the institutional norm, precluding that the decisionmaking process could be aided by other legitimate factors.⁴ The decisions around who is given a voice in policy formation ultimately shape the assumptions and discussions. It can only be expected that a group of specialized scientific experts will communicate and interpret meanings principally on their shared scientific platform as the way each person sees the data is shaped by prior experiences and training. This becomes increasingly complex at the global level when the interpretations, values, ideologies, and methods of communication differ by cultural context. Since the community of TDS professionals is cross-cultural and transideological, transcending political and organizational boundaries, the complexity can be framed and interpreted in terms of global governance mechanisms, including the international knowledge network – or the management of knowledge assets.

Literature on the modes of global governance⁵ is vast and consists of multiple dimensions, two of which I focus on in my research. The first dimension deals with

⁴ While this is a general notion in many policy domains, for specific literature on the implications of limited participation in Codex Alimentarius, see Hüller &Maier, 2006; Post, 2005; and Suppan, 2005)

⁵ “Global governance” in this context is used to mean “the complex of formal and informal institutions, mechanisms, relationships, and processes between and among States, markets, citizens and organizations, both inter- and non-governmental, through which collective interests on the global plane are articulated,

participation, or who is involved in developing the food safety scientific research models and data collection methodologies at the international level. The second dimension looks at the level at which the policy, management and the governance of a global food system occurs (international, regional, national, or local) and the interaction between these dimensions.

“Who’s Power?”

To understand how the total diet study interpretive community impacts the governance of the global food system, I incorporated basic social network questions into my survey that were designed to answer “who knows who,” “who knows who knows who,” and “who knows what.” Although the network is a synthesis of each respondent’s perception of a personal network, it still follows a preliminary network that was predicted from correspondence with informants and workshop proceedings.

The scientists at WHO and FAO were the most widely known and frequently contacted in the network, most likely attributed to their international role as support providers and main contact points. Respondents from countries with more developed TDS programs (i.e., U.S., New Zealand, Australia, France, and China) are more prominent in the tighter, primary network since they are often coordinating in preparation to lead the international workshops and training courses. Since these same actors are often consulted by countries with newer or no TDS programs, they were also well connected with the larger, secondary network. Additionally, China had the highest participation rate, so their own domestic network was more expansive than that in other countries. This does not necessarily indicate that they have more resources dedicated

rights and obligations are established, and differences are mediated” as defined by Thomas G. Weiss (as cited in ECOSOC, 2006, p. 4).

towards the Chinese TDS, but does seem to suggest the country's desire to contribute to the international standards setting process through TDS participation. Other respondents also stressed the importance of contributing to the international evidence base used in decisionmaking and standard setting.

As mentioned earlier, TDS results also serve as an indicator of environmental chemical contamination. An analysis of literature from U.S. federal regulatory agencies, specifically the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA), indicates minimal, if any, coordination on dietary exposure research although both agencies share responsibility for monitoring programs and pesticide regulation. The results of the social network also lack an indication of collaboration between food safety and environmental health networks. It is not clear whether this is true for other countries; however, the informants in Hong Kong, New Zealand, Australia, Japan, and Cameroon are employed by either a federal agency with jurisdiction over food and environment safety or by an environmental science research institution. The scope of this project is not broad enough to explore this apparent gap at the peripheries of the two policy networks, but it certainly merits greater attention in further research.

Unfortunately, at the time of this research, freely available network analysis software visualization tools are still in developmental stages, so I was only able to visualize a simplified, one-dimensional network that captured the first two questions mentioned earlier. The linkages in the social network diagram in Figure 3.1 represent coordination between actors (represented by nodes) for various aspects of designing and implementing a total diet survey. The size of the node is proportional to the number of

connections to that particular individual: the larger the node, the more relationships. The color and symbol schemes for the nodes can be interpreted as follows:

1. Different shapes represent political associations based on country income, with the exception of international officials:

◇ = experts from developed countries

○ = experts from developing countries

△ = international agency official

2. Different colors indicate organizational type:



- international agency



- regional offices of international agency



- national agencies



- district offices of national agencies



- contracted organizations (e.g. independent analytic labs)



- academic institutions

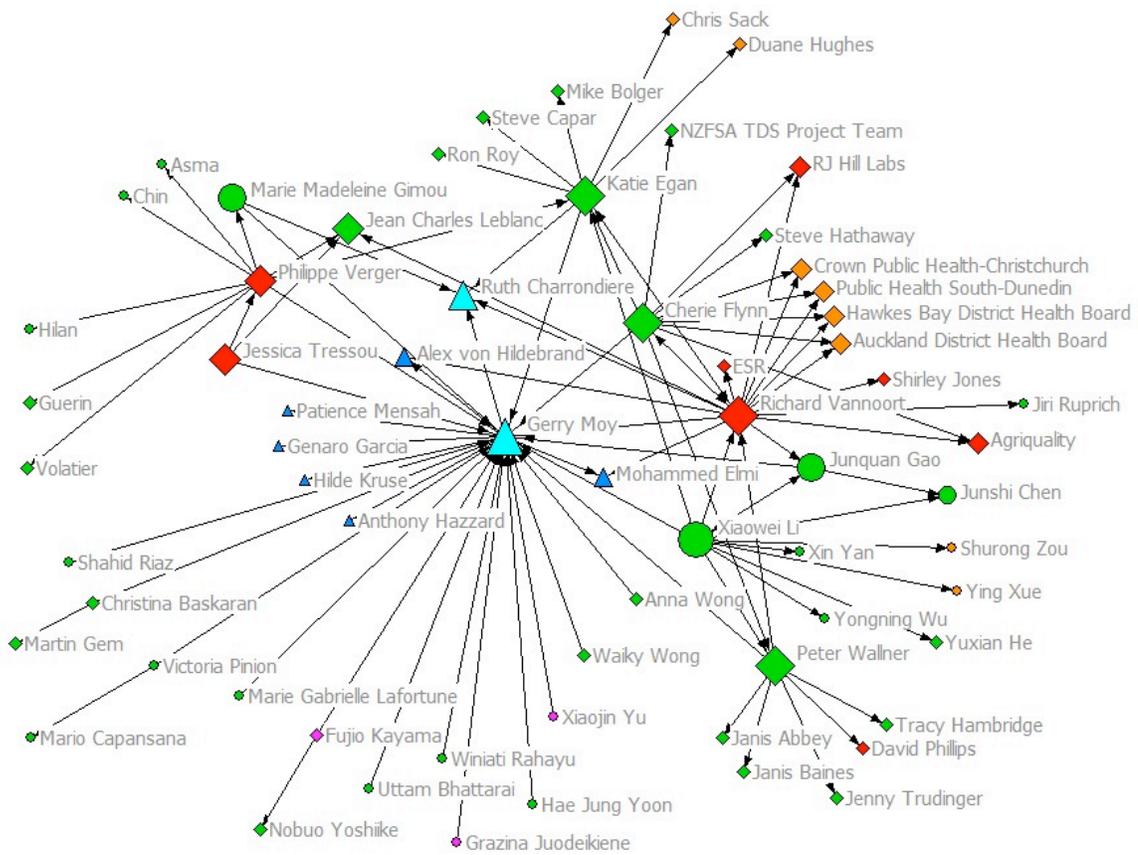


Figure 3.1. TDS social network visualization

(Source: created by author using network data from survey of TDS experts and UCINET social network analysis software)

Moreover, in the survey I collected other various dimensions, including role in the TDS process, place, frequency of communication, and local versus global networks, that could be utilized in further research for a deeper understanding of the multi-levels of practice and the knowledge distribution dynamics that support capacity building and knowledge distribution.

From an analysis of the social network map, the patterns of common responses from key informants around the world, and an analysis of the WHO international training course agendas, I began to recognize that to understand how **international** TDS studies

are designed and used for global food standards, **national** TDS models are the critical starting point. In addition I realized that this analysis also had to explore the degree to which power relations are embedded in data collection processes. Both the national agendas and the role of global power relations iteratively shape national and international policies, standards, and guidelines. Conversations with informants that participate in the international standards setting process and other risk related research, indicate that Codex Alimentarius standards – while based on scientific evidence – are also shaped by underlying assumptions (i.e., normative belief systems, assumptions of healthy food, and expectations related to cooking practices) that are specific to the social, political, and cultural contexts of the decisionmakers in the meetings. In most conversations these assumptions were referred to as “intangibles,” which suggests a perception that such implicit knowledge was immeasurable. Work done in the social studies of science and technology supports the notion that references to “sound science” and the lack of transparency created by technical language in policymaking establishes a perception of political neutrality that can disguise embedded social and economic interests, asymmetrical power relations, such as those influenced by gender and minority status, and simple propaganda.

In Table 3.1 below, the countries of the survey respondents are sorted by income level and some additional data are presented on basic details of their TDS programs (if they have one), relationship to Codex, and approximate number of ethnic groups. Just twenty-nine countries have official TDS programs, and mature programs, which tend to be continuous, only exist in high income countries. Interestingly, though, the majority of survey responses came from countries that conduct total diet studies periodically (i.e., no

established schedule) to rarely, or not at all. The discrepancy between frequency of dietary exposure assessments in developed countries warrants further analysis of the benefits and costs of continuous assessment compared to routine periodic assessments.

Much of the language in the responses of those particular country officials was very similar in comparison to language in WHO TDS publications. Further, actors from the industrialized nations with mature programs are consistently the primary leaders in the international training courses coordinated by the WHO. For instance, in 2006, two representatives from New Zealand and one from China (host country) led training sessions for 50 participants from 22 countries in collaboration with officials from WHO and FAO (WHO, 2006b). In the 2002 training course, sessions were led by officials from the U.S., New Zealand, Australia (host country), France, and Finland in addition to the WHO and FAO experts (WHO, 2002). Although the actual influence of their leadership is difficult to measure, this is a common theme shared with the Codex standards setting process (Hüller & Maier, 2006). In the 2002 evaluation of Codex, the imbalance of participation was highlighted as a key area for improvement, stressing the importance of improving the participation of developing countries to truly achieve democratic decisionmaking (CAC, 2003). Since all of the countries who participated in the survey are also members of Codex, their participation in programs that contribute data and evidence to the standards setting process, such as TDS, could be an opportune avenue to increase their influence beyond simply being present at the CAC plenary meetings. Many of these countries also have the highest heterogeneity in terms of ethnic populations, which is likely to not be adequately captured in the policymaking process at present since they do not conduct total diet studies, and thus, are not contributing exposure data to the

database. This point also illustrates the importance of this research as those countries proceed to plan a TDS program.

Table 3.1. Comparison of survey respondents with respect to global food policy programs and country profiles.

| <i>Country</i> | <i>Year Started</i> | <i>Frequency</i> | <i>Codex Member</i> | <i>Codex Committee Host</i> | <i>Income(GNI per capita^a)</i> | <i>No. of Ethnic Groups^b</i> |
|------------------|---------------------|------------------|---------------------|-----------------------------|---|---|
| UK | 1960s | annual | Yes | Yes | High | 8 |
| France | 2000 | periodic | Yes | Yes | High | 6 |
| Australia | 1970 | biannual | Yes | Yes | High | 4 |
| New Zealand | 1974 | 5-6 years | Yes | Yes | High | 6 |
| USA | 1961 | continuous | Yes | Yes | High | 7 |
| Japan | 1977 | annual | Yes | Yes | High | 4 |
| Hong Kong, China | n/a | planning stages | Yes | No | High | 3 |
| Rep. of Korea | 2000 | rare | Yes | No | High | 2 |
| Lithuania | 1993 | periodic | Yes | No | Upper-middle | 4 |
| China | 1990 | periodic | Yes | No | Lower-middle | 12 |
| Cameroon | 2006 | initial stages | Yes | No | Lower-middle | 8 |
| Indonesia | 2006 | pilot | Yes | No | Lower-middle | 9 |
| Philippines | n/a | none | Yes | No | Lower-middle | 9 |
| Haiti | n/a | none | Yes | No | Low | 3 |
| Pakistan | n/a | none | Yes | No | Low | 5 |
| Nepal | n/a | none | Yes | No | Low | 10 |

Source: author's figure based on survey responses, CAC membership, and the following sources:

^aFrom World Bank country classification (2006 gross national income per capita): low income, \$905 or less; lower middle income, \$906-\$3,595; upper middle income, \$3,596-\$11,115; and high income, \$11,116 or more.

^bFrom CIA World Factbook (2008); "other" and "mixed" (if listed) each counted as one ethnic group

“What Knowledge?”

Participation and power relations are issues that are closely linked to the types of knowledge that are used to justify the mechanics of the TDS process. Earlier I discussed diversity in regards to culture and geography and its effect on meaning interpretation and justification, but another equally important area of consideration is the expertise and training of the individual actors. Perhaps a major contributing factor to the loss of the cultural context is lack of a broad multidisciplinary cohort, especially the underrepresentation of the social sciences. As discussed in Chapter 1, scientists like Mead played a prominent role in the establishment of data collection methods for food habits in the 1940s. Although social scientists appear to be more active on nutrition issues - developing culturally appropriate dietary guidelines, oversampling specific subgroups of the population in consumption surveys, and analyzing the nutrient composition of more culturally specific foods - they seem to have mostly faded away from food safety research. The highly specialized epistemic network specific to the TDS community is displayed in Figure 3.2.

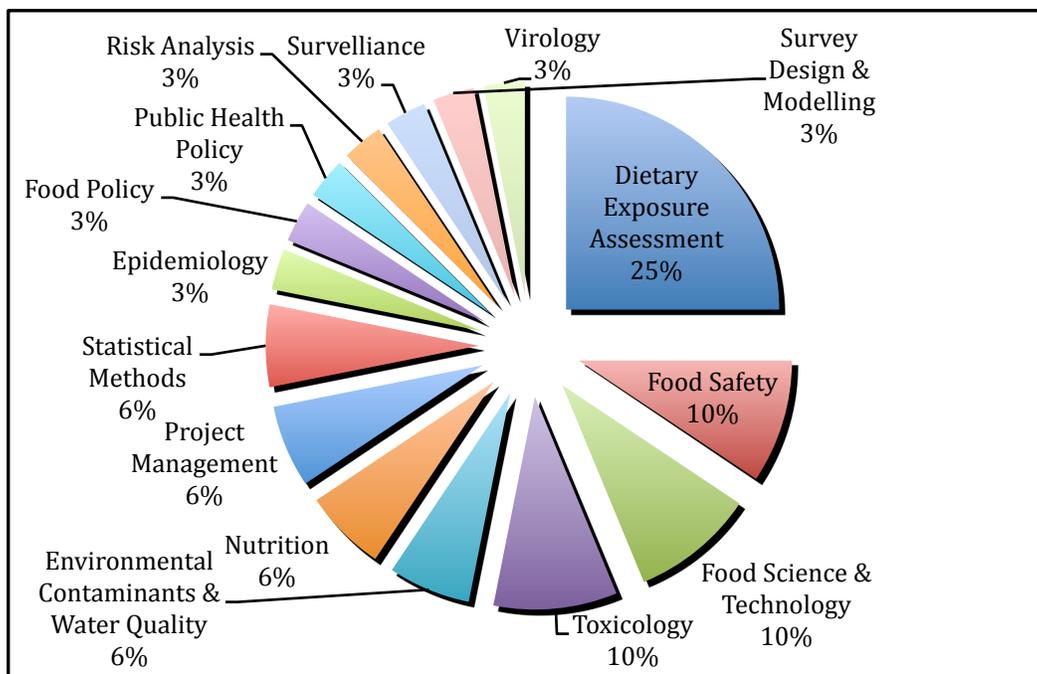


Figure 3.2. Areas of expertise as indicated in the online survey of TDS experts.

(Source: author's figure; question was open-ended so some respondents provided more than one answer, all of which are captured in this figure)

The dominance of actors that have expertise in the very specific field of exposure assessment is quite logical given the policies informed by TDS results have underpinnings in the risk assessment step of the risk analysis framework and, thus, demand strictly objective data. However, can the data truly be objective and impartial when the development of the collection tools is effectively based on the ideologies and values that have been shaped by the personal experiences of the actors? Further, what are the implications of operating from such a limited scope? As Hüller and Maier suggest about types of knowledge networks in Codex, “The problem with expertise in Codex standard-setting is not too much, but too little and too specialized or constrained expertise” (2006, p. 291).

Earlier I mentioned the prevalence of industrialized nations leading the international TDS training sessions. This distinction is important to make because these individuals live and work in societies that operate based on a capitalist mode of production and a vertically-integrated, intensive, and increasingly concentrated model of agribusiness that is not universal to the rest of the world. For example, in the pilot stages of conducting a TDS, Cameroon sampled the dietary exposure of the population in Yaoundé, the capital city, where there is a growing population of urban agriculturalists that grow leafy vegetables and fruit trees around their property for both commercial and household use. Was this different model of agriculture taken into consideration in the sampling plan? Urban agriculture among poor urban dwellers can pose very different food safety risks associated with the quality of the ground being farmed and the water used for irrigation. These observations bring us to the investigation of the assumptions made when countries select the foods and preparation methods for analysis.

“Which Food?”

The literature on the various nutritional and food safety risk assessment methodologies contains several voids in regards to how culture, values, and social norms influence food habits. Specifically, little attention is paid to variations in preparation methods (e.g. types of pots and pans and cooking mediums), which tend to be strongly associated with specific food cultures and ethnic identities, and, in some cases even dietary exposure to nutrients or chemical contaminants. The majority of responses to a survey question on special dietary restrictions and traditional food habits were very general and indefinite, reinforcing this gap in the literature. To address this blind spot, I

raise the following three questions that are based on language in definitions of TDS and indicate the need for recognition of a socio-cultural perspective:

- What food?
- Who defines what comprises “table-ready” preparation methods?
- From where are the foods acquired?

Based on the literature available to me, I am choosing to specifically focus on the methods and assumptions employed in the U.S. to generate the TDS food list that is combined with TDS diets (TDS food consumption values) to calculate dietary exposure for the total population and 14 age/gender population subgroups. The process used to update the TDS food list and diets is represented in Figure 3.3.

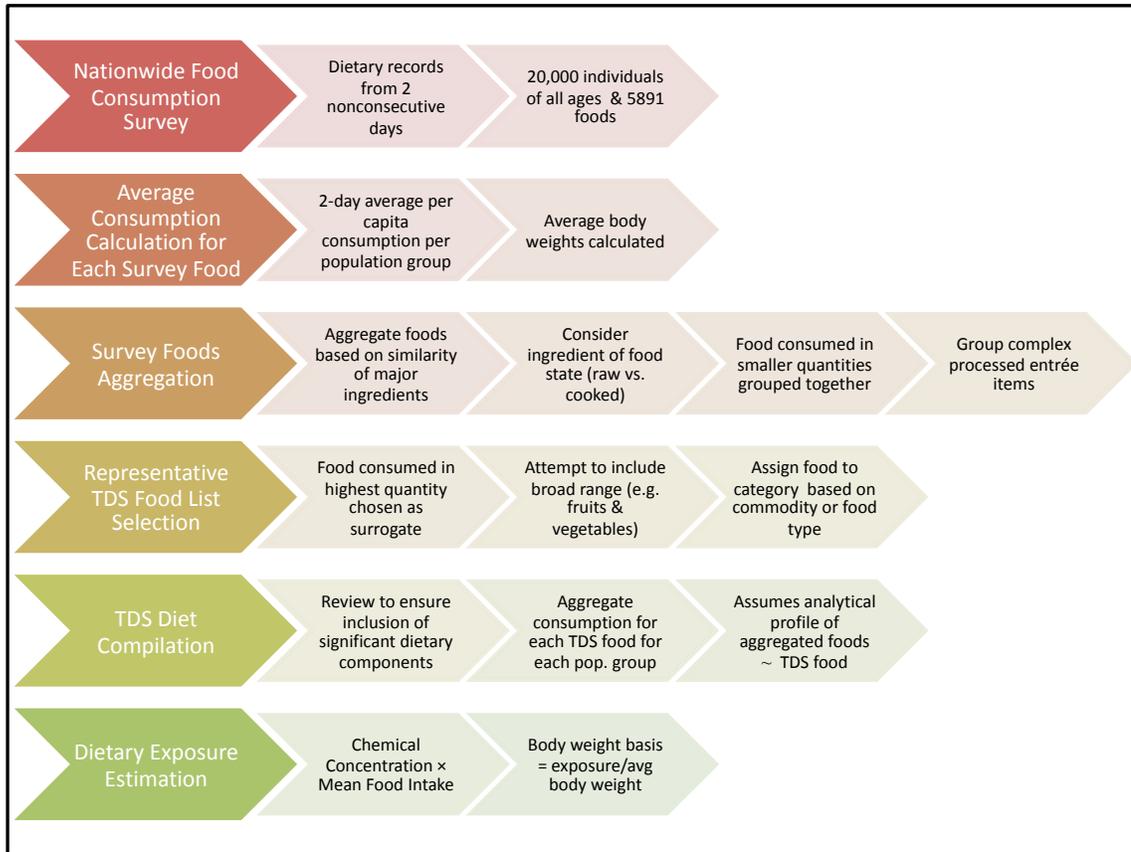


Figure 3.3. Methodological steps employed to update the U.S. TDS food list and TDS diets in 2003.

(Source: author's version, derived from Egan, Bolger, & Carrington, 2007)

The diagram illustrates the degree of aggregation and homogenization that occurs to generate a manageable list of food items for analysis. Is it possible that the averaging is biased in favor of certain groups based on the effectiveness of the food consumption survey sampling plan? The process also indicates that TDS capture what foods are actually being consumed (that is, about every 5 years or so when the consumption surveys are conducted) and not what foods should be consumed based on federal dietary guidelines. Like many criticisms of the guidelines though, they assume there is something called a “national diet,” which often sacrifices culturally diverse food habits in favor of

statistically sound data. It is true that the way to compile a national diet is by averaging the food habits of each individual together, but how can this possibly maintain integrity to food habits that differ across space?

In contrast to the abundance of information on how TDS food lists are created, there is very little written on just how the foods are prepared “table-top ready.” For some foods this is rather obvious, like peeling bananas prior to analysis or thawing and cooking a frozen chicken potpie. Yet, it is not so obvious for more complex meals that can contain an endless variety of ingredients and several different cooking methods (e.g., is it cooked over the stove in a stainless steel pot stirred with wooden spoon or does it slow cook all day in a slow cooker?). Who is responsible for determining which recipes will be followed for the analysis?

Referring back to the case of developing risk management plans for dioxins, the decision on where the food is acquired from is another subjective assumption. Subsistence fishers and farmers pose an interesting challenge because most risk management decisions specifically focus on exposure assessments from commercially available food products. In countries such as the United States where less than 2 percent of the population is directly employed on the farm (i.e., excluding farm-related employment), this may not be significant, but it is a major factor when working with less developed countries where this percentage is higher and pastoralist communities are common (USDA, 2002). The recent events unraveling in Haiti and other poverty-stricken areas around the world in response to the global food crisis interjects another interesting twist that exemplifies the need for a socio-cultural perspective that will keep up with continuously evolving consumption patterns, but is difficult to manage when dealing with

the massive amounts of data gathered in periodic consumption surveys. The growing demand for commodities and rising food prices has driven hungry Haitians to scavenge for food in garbage dumps in Port-Au-Prince (Lacey, 2008). Imagine all the contamination and hygiene issues associated with picking out food from a dump, and then ask whether the lab technicians responsible for the TDS analysis would go there to get their samples. The ignorance towards the situational context in methodologies that provide evidence for policies is inevitably cutting away from the rigor of the tools that this knowledge network has worked so hard to develop and essentially eroding any pre-existing notion of ethical conduct and accountability along the local to global continuum.

CHAPTER 4

PROSPECTS & CONCLUSIONS

During the time of this research and analysis, an interesting case study emerged on chemical contamination of buffalo mozzarella in Italy. Major news outlets, including *The Independent* (2008, March 22) and *The New York Times* (2008, March 26), had coverage of high levels of carcinogenic dioxin found in buffalo mozzarella produced at dairies in Campania linked to illegal dumping of toxic waste nearby. One key informant from WHO speculated that “the dioxin episode now unfolding in Italy could have been avoided” had country government officials understood the importance of conducting TDS. Italy does have a TDS program, but they have not conducted a study since 2001/2002 (Lombardi-Boccia, Aguzzi, Cappelloni, Di Lullo, & Lucarini, 2003). Although the issue raised by the WHO scientist is important, it also necessitates a new question in response: Is buffalo mozzarella even one of the core foods in the Italian total diet study? The Italian buffalo mozzarella industry is a significant piece of the domestic economy and well known internationally, bringing in nearly half a billion dollars in sales from 30,000 tons of cheese annually (Fisher & Pinto, 2008; McCarthy & Phillips, 2008). As only 16 percent of that is exported to Europe, Japan, and Russia, that means Italians consume most of their own mozzarella. Yet is buffalo mozzarella consumed in great enough quantities to be captured by the national food consumption survey and chosen as a TDS food? In other words, how close are the data to actual consumption habits of specific niche foods that may be associated with very different risks than their surrogate TDS food (e.g., cheese from cow’s milk or even buffalo mozzarella from a different

region)? If linkages such as this are not recognized in the methodology, could the Italian TDS really have played a role in preventing this “crisis”? If not, then what needs to be done?

This thesis was undertaken as a way to begin to explore this issue in more depth and so hidden questions such as those raised here can be asked, new linkages drawn and imminent food safety issues be understood. Human consumption of food does not occur in a vacuum, but is transformed by cultures, technological advances, marketing systems, and institutions. The interdependencies created by the liberalization of trade markets combined with urbanization and rapid transformations in information technology and science have managed to construct a global economy with minimal consideration for what it takes to build a global society that identifies people as citizens instead of consumers (FAO, 2001). There is no criticism or judgment of the way total diet studies are currently carried out; rather, there is a critical need to make the TDS and other data collection techniques that inform policy as rigorous, flexible, and relevant to emergent issues as possible.

Program and Policy Prospects

The readings done for this research have offered a variety of ways in which a TDS can be a beneficial instrument and shown they are an essential element to monitor and improve the health of a country’s population, and now, the health of the world. Nonetheless, the question of what changes should be made given the concerns posed within this thesis still looms. First, and most obvious, support and capacity building for TDS at the international level should be sustained. Without a doubt, the WHO needs to

continue to maintain its guiding role in establishing standardized methods of analysis, holding international workshops and training courses that contribute to the maintenance of global food composition databases and provide the global perspective of problems with chemical contaminants in the food supply. Second, more emphasis and work should be placed on particular aspects of methods that are currently in practice and have been effective in various countries. Third, further consideration should be given to complementary emerging methods that allow for cultural analyses of food consumption and visualization tools that now have the capacity to handle the prolific amount of information that is already available from previous cultural analyses, such as ethnographies, and increase our ability to comprehend large quantities of data. For example, advancements in geographic information systems (GIS) technology would allow for the geocoding of subpopulation density census data in the U.S. Overlaying the resulting data with the existing geographic distribution would strengthen the market basket approach by including cultural and ethnic boundaries within the country. This form of geocoding could also be extended to other countries for similar benefits (J. Fountain, personal communication, May 3, 2008). Implementation of such complementary methodological approaches would significantly diversify the type of knowledge used to frame the methodological discourse as discussed in Chapter 3. Finally, it is also important to consider changes to the institutions and governance mechanisms that guide the exercise of authority, power, legitimacy, and accountability and provide the context and structure within which the network collaborates and builds collective knowledge.

Journal articles and conference presentations on the experiences of individual countries in carrying out a total diet study exhibit the use of less standardized methods that make a specific effort to sample for the effects of locality, season, and traditional foods. Similar initiatives are appearing within the nutrient composition analysis community and can serve as models for the TDS program in cases where indigenous peoples, cultural diversity, non-normative dietary practices, religious dietary restrictions, nonretail food sources, and varying agricultural production methods create challenges for the dominant methodology. A brief list of some of these initiatives follows.

- Researchers in the U.S. helped analyze dietary data from Nigeria’s national food consumption survey by developing a population-specific database of Nigerian-specific foods and recipes (Day, Douglass, & Maziya-Dixon, 2008).
- A Canadian researcher conducted field work within traditional food systems of indigenous peoples to analyze the nutritional composition of traditional food resources. The findings indicated the nutritional importance and cultural value of these food resources to the local populations and provided “rich information” for food and nutrition communication and educational activities with the indigenous communities (Kuhnlein, 2000, p.657).
- Since New Zealand conducts a TDS every 5-6 years, time in between studies can be spent on smaller projects that focus on reworking the data for specific cultural groups (FAO, 2004).
- In its first TDS, France used food consumption data for vegetarians based off a specific vegetarian consumption survey in addition to the total population data.

- The first TDS in Papua New Guinea utilized local knowledge to collect food consumption data and sampled in urban and rural environments to capture the difference between commercially-sourced foods and those obtained through subsistence agriculture practices (WHO, 2005).

Further, examples of proposed and emerging governance and institutional changes include the following:

- EuroFIR is leading efforts in Europe to establish a legal definition of “traditional” foods in order to protect cultural diversity and prevent misuse of the term as a marketing tool for imitation products. They are also scientifically investigating traditional foods to understand nutrient composition and, thus, the impact on public health (Trichopoulou, Soukara, & Vasilopoulou, 2007).
- Damman et al. (2008) suggest the adoption of a framework that recognizes and understands the rights of indigenous peoples and the universal right to adequate food for formulating policies that protect cultural diversity and minimize the threat of the homogenization of dietary habits in indigenous communities. They also indicate that in order for the policy to be honored and supported by a community it must account for the local context, which can only be accomplished through an inclusive and participatory process.
- FAO has organized an internal committee on food and agricultural ethics to provide ethical guidance and facilitate dialogue on the relevance of ethics and human rights to stimulate international understanding of key ethical issues. Several ethical principles have been highlighted as critical for building and ethical

and equitable food and agricultural system since its creation in 2001. Of particular relevance to this thesis is the call for development of an ethical code of conduct that guides organizations, governments, and networks on the principles of ethical behavior. Their first report also calls for increased diversity in stakeholder participation in policies and programs (FAO, 2001).

- The design and content of the New Zealand Total Diet Study (NZTDS) undergo extensive consultation with stakeholder groups (e.g. public health, academia, research institutes, industry groups, and consumer groups) to establish transparency (FAO, 2004).

These examples of methodological procedures and governance mechanisms are simply used to demonstrate the outcomes generated from the engagement of broad-based collective knowledge. They also highlight the innovation that can result from cross-collaboration even within the confines of deeply entrenched institutions. Certainly with any proposed action that challenges a deeply-rooted paradigm there comes concerns within the knowledge network about the effect of the changes. Within the TDS network, this is most likely to deal with the impact on data quality and international harmonization of TDS protocols. I discuss these concerns in the next section and then conclude with a reflection on my findings.

Prospect Limitations

I can foresee two avenues of hesitation for the proposed projects: cost and the loss of current abilities to compare data across countries. It is not likely that the budgets of federal agencies responsible for TDS will allow for increased financial support for the

program in the near future, which accounts for the value placed on cost-effectiveness by many informants. Baseline cost of a total diet study is currently estimated at US\$125,000 provided the country already has some information on food consumption (WHO, 2006b).⁶ A significant percentage of this cost is associated with the level of expertise and measurement equipment that is needed for the analysis. The duplicate diet sample collection method has been used previously by smaller countries and the USEPA to specifically capture contaminants in food items (retail and nonretail) as truly prepared for consumption by collecting exact duplicate portions of individual foods or meals made in the home or purchased at a restaurant (Berry, 1997; Thomas, Sheldon, Pellizzari, Handy, Roberds, & Berry, 1997). While this does address some of the cultural assumptions made in TDS, it has several well-documented disadvantages, including a high respondent and researcher burden, high costs, a bias in the intake estimate from participants altering their food consumption because they are being studied, and the “dilution effect”⁷ (J. Pennington, personal communication, Feb. 7, 2008). At minimum, the ideas proposed here essentially require increased collaboration with nontraditional parties outside the epistemic TDS community. This could mean more coordination with the social scientists (intra or interagency) that develop the consumption surveys to also help develop the list of TDS foods and their preparation methods. Alternatively, a research analyst with experience in social science methodologies, qualitative data analysis software, and visual

⁶ A cursory review of the literature calls into question costing differences between countries. Most WHO literature estimates program costs at \$125,000, but with no breakdown of costs per activity. A report from the 2002 Latin American TDS Workshop (INPPAZ) estimated the costs for starting up regional total diet studies to be \$460,000 per country. Given the high level of resources needed (e.g., people, equipment, sample acquisition, training) to for TDS, the actual cost will vary by country, and thus, goes beyond the scope of this research. A deeper examination of the cost-benefit or cost-effectiveness analysis is a potential area for future study.

⁷ In this context, the “dilution effect” refers to the failure to detect substances present in small amounts because of the larger sample size.

analytic tools could be hired onto the research team in each country or as support at the international level. It could also suggest initiating new means for broader stakeholder participation in training courses, international workshops, program design, implementation, and public education. Other possible expenses might be associated with an increase in the number of samples collected and analyzed and the acquisition of data visualization software (several of which are beginning to become more freely available and user friendly for non-experts). Furthermore, some degree of comparability may be surrendered due to method variability, but new dimensions (e.g. culture and time and space) on which to compare the data will emerge from new ways in which the data is collected and analyzed.

Conclusion

In 2008, the world is facing a combination of limited resources, new food safety challenges and complexities, and declining public confidence in the safety of the food supply. Despite this, the global dietary monitoring system continues to grow in an effort to implement total diet studies in more developing countries. The complexities of globalization necessitate a multi-site (macro-micro) approach that links the global perspective to the local perspective by resting the responsibility and obligation on each nation to internally address specific dietary patterns that are tied to cultural, social, and religious traditions or norms in their policies and programs. Attention to this is essential as it becomes increasingly more difficult to define food habits and national diets in a bounded, reified, and timeless fashion. The embeddedness of the TDS knowledge network within socio-cultural and political contexts that diverge on a local scale

ultimately shape cognitive and normative behavior as well as power relations on the global scale. The limited, but highly specialized, backgrounds of these network actors also illuminate the type of knowledge that dominates the TDS discourse. Therefore, during transnational risk management and policymaking processes attention should not only be directed towards the validity of the input data, but it should also consider the assumptions and expectations derived from experience and training that are held by actors in the program that is responsible for collecting and analyzing that data. Various changes to the modes of governance that regulate network interactions could support increased participation, accountability, and transparency, and thus harness interdisciplinary collaboration between the social and technical sciences.

The insights provided by examining the knowledge network create a linkage to the interpretation of meaning and value of total diet studies to different countries. The questions posed in this thesis demand reflection, dialogue, and action in order to successfully balance the TDS program criteria of affordability and efficiency with true representativeness and authenticity of the data. New complementary social science software programs are now providing researchers of all disciplines and backgrounds the ability to analyze large amounts of nominal, ordinal, and interval data. These data can then be compared on numerous dimensions to reveal patterns and concepts using the emerging visualization tools that tap into the power of human visual intelligence. However, it is important to remember that TDS is just one of several tools, such as food composition databases and other nutrient analyses, that inform policy and program formulation. Necessarily, the issues that arise from this study are not solely challenges faced by total diet studies, and must be considered in the implementation of similar data

collection processes. With negligible percentages of regulatory agency budgets and staff dedicated to the TDS, but rising concerns over the quality and safety of imported commodities and foods, it is an opportune time to re-examine and strengthen data collection methods to more appropriately address human food system complexities with limited resources. For something that has fundamental underpinnings in human life, it is a stark thought that data on food consumption and dietary exposure can justifiably be removed from its socio-cultural context and still considered realistically accurate.

APPENDIX A

TOTAL DIET STUDY INFORMANT COMMUNITY ONLINE SURVEY GUIDE

TOTAL DIET STUDY SURVEY GUIDE

Lay Summary

To fulfill the thesis requirement of a Masters (MPPA) degree in Food Science Policy, I am researching the creation of local, regional and global food policies and food system governance mechanisms. The specific focus of the research is on how food-related intake data are collected and used as evidence to inform food safety and nutrition policies. The fundamental question that this research seeks to answer is:

“To what extent is cultural and ethnic diversity in food preparation and consumption recognized, understood, and integrated into food safety research methodologies, national policy, and food safety guidelines?”

The current focus of this survey is to understand the interaction among networks of people, organizations, and nations during the establishment of food policy. In this regard, I am interested in learning more about the flow of information between professionals involved in Total Diet Studies around the world.

Given your experience with TDS in your own country and through the WHO International Total Diet Studies Workshops, I would like to invite you to participate in my research project. There are no right or wrong answers to the questions I am asking, and your participation in this study is completely voluntary. You may choose to stop participating at any time after you have started. If you decide to remove yourself from the study, your decision will not affect any future contact you may have with the University or myself.

It is my hope that the questions below do not take more than 15-20 minutes to answer. Please return your responses to laura.pillsbury@gmail.com by Thursday, April 3, 2008. I greatly appreciate your help in my endeavors and am looking forward to the responses!

I. First, I would like to get a sense of who you are and your role in the TDS.

1. What is the name of your employer? Please include the specific division/department or group that you work for.

2. What do you consider to be your areas of expertise?

II. Now, I hope to strengthen my understanding of how TDS operates and why it is of importance to your country through your responses to the following questions.

3. From your perspective, what do you think is the greatest value about TDS for your country?

4. How are the results of TDS used in your country, and by whom?
 - a. Are TDS results used to inform any part of the risk analysis process (risk assessment, risk management, and risk communication)? If so, please elaborate.

 - b. Are TDS results used to inform new or support existing policies, regulations, guidelines, or programmatic decisions in your country? If so, please elaborate.

5. If you could change the ways in which TDS operates, what would you like to see happen, and what would it take to make it happen?

III. Next, this is where I would like to learn more about the global and local knowledge networks of actors involved in TDS.

6. Please list 5-10 other people or organizations **within your country** who are involved in the design, implementation, or analysis of TDS. In the right column, please indicate how often you coordinate with the particular individual (e.g., daily, weekly, monthly, rarely).

| Actor Name | Employer | Responsibility with respect to TDS | How often do you coordinate with this person? |
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7. Please list 5-10 people or organizations **outside your country** that you work or communicate with about TDS issues. In the right column, please indicate how often you coordinate with the particular individual (e.g., daily, weekly, monthly, rarely).

| Actor Name | Country and/or Employer | Responsibility with respect to TDS | How often do you coordinate with this person? |
|-------------------|--------------------------------|---|--|
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IV. Finally, I have a few questions regarding the design and procedures of your country's TDS.

8. How are the foods analyzed in the TDS determined (i.e., from food consumption surveys, model diets, regional diets, etc.)?

9. Are special dietary restrictions or traditional food habits taken into account in the TDS design and data collection? If so, please elaborate.

Please use the remaining space to add any comments or thoughts about the questions or other aspects of TDS that may have been overlooked.

Thank you very much for your time and support of this research. Your inputs are most appreciated. Please let me know if you are interested in being sent a copy of the thesis upon its final approval.

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