Translating research into action: a case study on trans fatty acid research and nutrition policy in Costa Rica

Uriyoán Colón-Ramos,1* Ana C Lindsay,2 Rafael Monge-Rojas,3 Mary L Greaney,2 Hannia Campos2 and Karen E Peterson2,4

Accepted 9 July 2007

Mounting epidemiologic evidence worldwide has fostered policy regulation of industrially made trans fatty acids (TFA) in several developed countries. Despite country-specific evidence about the effects of TFA on cardiovascular disease in Costa Rica, policy regulation has yet to occur. This qualitative study uses a conceptual framework to identify factors that may impede or promote the process of translation of scientific evidence about TFA into policy in the specific context of Costa Rica.

We used single case-study methodology to integrate two sources of data: review of relevant internal documents and in-depth, semi-structured interviews with 21 respondents purposively sampled from three sectors: the cooking oil and food industries, research and academia, and government entities. Content analysis, guided by a conceptual framework of research utilization, revealed 68 emergent themes divided across four categories of analysis.

In brief, study participants perceived the political context suitable for discussing policies related to healthy fats. Nevertheless, TFA regulation was not part of the Costa Rican political agenda. Barriers perceived by respondents that impede knowledge translation included: (1) lack of awareness of in-country scientific studies on health effects of TFA; (2) lack of consensus or information about policy options (nutrition labelling, dietary guidelines, legislative mandates); (3) perceived distrust and disparate attitudes between sectors, believed by study participants to result in (4) limited collaboration across sectors.

Commissioned task forces and other mechanisms to foster research engagement and facilitate sustained interaction and systematic collaboration among government, food industry and researcher sectors appear crucial in the consideration and adoption of nutrition policy in Costa Rica and other emerging economies.

Keywords Health policy, nutrition, Costa Rica, developing countries, trans fatty acids

1 Behavioral Research Program, National Cancer Institute, Bethesda, MD, USA.
2 Program in Public Health Nutrition, Department of Nutrition, Harvard School of Public Health, Boston, MA, USA.
3 Costa Rican Institute for Research and Education on Nutrition and Health (Instituto Costarricense de Investigación y Enseñanza en Nutrición y Salud), Ministry of Health, Costa Rica.
4 Department of Society, Human Development and Health, Harvard School of Public Health, Boston, MA, USA.
* Corresponding author. Health Promotion Research Branch, Behavioral Research Program, National Cancer Institute, 6130 Executive Blvd MSC 7335, Bethesda, MD 20892–7335, USA. Tel: +1 301 657 2101. Fax: +1 301 480 2087. E-mail: colonramosu@mail.nih.gov.
KEY MESSAGES

- Study of the translation of scientific evidence into action is crucial in the identification of factors that impede or promote this process, and can provide a template for other emerging economies that wish to establish nutrition- or health-related policy.
- In the case of Costa Rica and trans fatty acids, the knowledge-action cycle was impeded because of lack of awareness of in-country scientific studies; lack of consensus or information about policy options; and perceived distrust and disparate attitudes between sectors, believed by study participants to result in limited collaboration across sectors.
- Organizational infrastructures, such as commissioned task forces that review literature, or arenas that allow for interaction between sectors, could facilitate systematic collaborations between government, food industry and researchers, and are crucial for the consideration of nutrition policy regulations in this and other developing countries.

Introduction

Trans fatty acids (TFA) were first developed by the food industry more than a century ago to stabilize and solidify vegetable fats (Hartman Cohen 2006). Since the 1950s, epidemiologic evidence has accumulated worldwide showing the negative health effects associated with the intake of industrially made TFA (Anderson et al. 1957; Keys et al. 1957a,b; Willett et al. 1993; Ascherio et al. 1996; Hu et al. 1997; Pietinen et al. 1997; Omen et al. 2001; Oh et al. 2005). This evidence has fostered policy regulation of industrially made TFA in several developed countries in Europe and North America (Korver 1997; Hulshof et al. 1999; Gifford 2002; Enig 2003; Food and Drug Administration 2003; Stender and Dyerberg 2004), but little is known about whether such evidence has generated any policy actions in developing countries.

Costa Rica offers a unique setting to study the process of translation of scientific evidence into action. The most widely consumed cooking oil in this country is soybean oil (Kabagambe et al. 2002; Colón-Ramos et al. 2007). Although soybeans are imported, the majority of the oil sold in the country is produced nationally under different brands that share one parent company. Before 2000, soybean oil was the principal source of industrially made TFA in the country, containing as much as 22% of total fatty acids, and shown to be positively associated with increased risk of myocardial infarction (MI) in Costa Rica (Baylin et al. 2003a,b). Shortly thereafter, and for reasons that were not conveyed to the public, the Costa Rican soybean oil industry voluntarily modified its production process, resulting in a significant decrease in its TFA content. At these lower levels, an association between TFA and risk of MI was no longer observed (Colón-Ramos et al. 2006). While Costa Rican soybean oil is now free of TFA, other sources of this fatty acid still remain in the food market, such as margarines and baked goods (Baylin et al. 2007). No government action has been taken to regulate the TFA content of these and other foods sold in Costa Rica.

The objective of the current study was to examine the factors that promoted or impeded the process of translation of scientific evidence about TFA into government policy in Costa Rica. Methods and findings from this study may also provide a template that will be relevant to other emerging economies that are considering TFA regulation or more general nutrition policy regulations. In this study we use the term ‘regulation’ to refer to any policy action regarding industrially made TFA, including nutrition labelling, dietary guidelines and legislative mandates about a maximum permissible level of TFA.

Materials and methods

Understanding the process of translational research requires methods that can rigorously capture the intricacies and multifaceted characteristics of this real-life process. Descriptive, single case-study methodology is ideal because it allows integration of multiple sources of data (Yin 1994), such as internal documents relevant to the translation process in the context of Costa Rica, and in-depth interviews with stakeholders in three different institutional settings. This methodology helps our understanding of how and why the scientific evidence about TFA has not been translated into public health policy in Costa Rica.

Study setting

Costa Rica provides a unique setting and convergence of circumstances conducive to examine the process of the translation of evidence into policy. First, the country is home to an on-going heart disease study with an emphasis on diet components, which has provided extensive evidence about the negative effects of TFA intake in Costa Rica (Baylin et al. 2003a,b; Kabagambe et al. 2005; Baylin et al. 2007). The heart disease study is being conducted by the Harvard School of Public Health in partnership with the University of Costa Rica. Secondly, informal dialogues between representatives of the Ministry of Health, the cooking oil industry, and researchers from the Costa Rica heart disease study, about a potential TFA regulation, have demonstrated that this is a timely topic. The primary sources of TFA in Costa Rica are the cooking oils; for reasons that are unknown to us, the TFA content of these oils was reduced considerably shortly after these dialogues (Baylin et al. 2007). Finally, the relatively low visibility of the topic among the media and the public (Farral 2005a) facilitates the task of obtaining a complete picture of factors that promote or impede the translation of knowledge into policy action.

Conceptual framework

Standard qualitative research practices recommend the use of conceptual frameworks to guide data collection and the analysis
of complex and multidirectional research issues (Yin 1994). Consistent with these practices, our conceptual framework (Figure 1) was adapted from Walt and Gilson (1998) and had previously been used by Trostle et al. (1999) in health policy analyses in Mexico. This framework outlines the principles of the knowledge translation cycle whereby evidence is put into practice and research is utilized within the health sector to affect policy. The framework also provides four broad categories within which the process of translation of scientific evidence into policy can be promoted or impeded: (a) the current political context; (b) the scientific content pertaining to TFA and the content of the proposed policy reform; (c) the actors’ inter-relationships and roles in translating scientific evidence, and (d) the process of collaboration. These categories of analysis offered direction for the development of the interview guide, enabled a smooth flow during the interview exchange toward relevant avenues of inquiry, and structured the analysis.

Data collection procedures

Data were collected in Spanish by the principal investigator, who is a Spanish-speak and trained interviewer, in Costa Rica in October 2005. Data were collected from two different sources: (1) relevant documents and (2) individual semi-structured in-depth interviews. The results from the document review and interviews will be integrated in order to corroborate information and support different perspectives.

Collection of relevant documents

To compile all relevant documents, we systematically reviewed materials that provided a socio-political or historical context of the topic of TFA and/or more general nutrition policy in Costa Rica (such as interim reports, project proposals and country-specific news stories, among others). The review occurred prior to and during the time of the interviews.

We conducted a systematic Internet search in English and Spanish using the terms ‘trans fatty acids’, ‘partially hydrogenated oils’ and ‘Costa Rica’, and searched websites of the Costa Rican government, the University of Costa Rica and INCIENSA for documents related to trans fatty acids, dietary fats and chronic diseases. These Internet searches produced three newspaper clippings, one Ministry of Health meeting agenda, and a list identifying members of the different subgroups that form the Costa Rican committee of Codex Alimentarius. The principal investigator and INCIENSA collaborators also searched libraries of the University of Costa Rica and of INCIENSA, and public documents from the Ministry of Health. Few documents were retrieved using the search terms ‘trans fatty acids’ and ‘partially hydrogenated oils’. Expansion of the search to include documents related to dietary fats, nutrition labelling and dietary guidelines yielded three documents from an INCIENSA journal and one document concerning dietary guidelines for Costa Rica. Three additional documents were also retrieved during the interviews with government informants, who were asked for any information that would support their responses. Information from retrieved documents was used to inform the development of interview guides and used during analysis to supplement and corroborate the information provided by interviewees.

Sampling frame for interviews

Previous work on translational research underscores the importance of employing different perspectives to fully grasp a diversity of factors and mechanisms involved in the process of knowledge translation (Baranowski et al. 2000; Margetts et al. 2001; Mebane and Blendon 2001). To achieve this, we aimed to interview informants from a wide range of backgrounds and perspectives on the topic of TFA as it related to: nutrition and health, the food supply, and policy formulation. We started by taking advantage of the network already established by the principal investigators of the large heart disease study. These initial contacts provided us with the names of potential informants from three different sectors: (1) the food and cooking oil industry, (2) research entities (state university and research institutes), and (3) the government (Ministry of Health, Ministry of Economy and Ministry of Exterior Commerce). The reasons for the purposive sampling from these sectors were twofold: first, prior knowledge from initial key informants indicated that the topic of TFA had been discussed only in these sectors; second, we hoped to attain potentially divergent opinions by interviewing sectors with traditionally different roles and interests. To ensure that we interviewed a majority of respondents who were knowledgeable on the topic of nutrition research and/or policy formulation in Costa Rica, we used the snowballing technique, asking the informants to identify anyone else with whom we should speak.

Purposive sampling was conducted in two stages. Researchers affiliated with the heart disease study, who were familiar with relevant Costa Rican institutions, identified six potential interviewees, two each from the food industry, research and national government. We used a snowballing technique with these six individuals to identify other key informants, with a goal of 15 in-depth interviews, or five per sector. The response rate for interviews with informants in research and the government was 100%; using the snowballing technique until it delivered the same names, we ultimately conducted nine interviews each in these two sectors. For the food and
cooking oil industry, the use of the snowballing technique yielded the same three names of the informants that we ultimately interviewed. In an effort to expand the number of interviews in this sector, two other potential informants from the fast food and restaurant industries were identified through the telephone directory. We were not successful, despite thorough follow-up, in obtaining interviews with these two individuals. Nonetheless, since the main source of TFA in Costa Rica was its soybean cooking oil, and since all of the producers of this oil in Costa Rica share the same parent company, we were satisfied with being able to obtain responses from two different informants in this industry. The third informant whom we interviewed represented the dairy food industry. In total, we conducted 21 in-depth interviews across purposive sampling strata.

Collection of interview data
Interview data were collected using a semi-structured guide with open-ended questions. Consistent with standardized qualitative research methods, this approach allowed for the collection of rich, detailed knowledge about processes, relationships and constraints within a culture-specific context (Kroeger 1983). The questions in the interview guide reflected the informants’ knowledge and perception of scientific studies about TFA; their role and attitude toward the topic; their opinion about potential policy strategies for TFA regulation; and factors that may have promoted or impeded the collaboration process between actors and sectors toward TFA regulation (Appendix 1). The guide was fine-tuned after a consultative phase with key informants in Costa Rica and pilot-tested in Spanish in that country. The guide was occasionally revised to illustrate new issues that had come up in earlier interviews, maximizing strong qualitative methods.

All participants were interviewed on a voluntary basis. We employed the following standard qualitative techniques: digital recording of all interviews (when permitted by the respondent), verbatim transcription by an independent transcriber, and translation into English by bilingual translators not related to the study. The Scientific Ethics Committee of the Costa Rican Institute for Research and Education in Nutrition and Health (INCIENSA) and the Human Subjects Committee of the Harvard School of Public Health reviewed and approved the current study and data-gathering instruments.

Data analysis
All interviews and relevant documents were coded using QSR Nvivo Software Version 2.0. In conducting this as a qualitative case study, the primary investigator took the role of interviewer and, given his familiarity with the topic, also performed all thematic coding (this is a standard qualitative procedure and has the advantage of providing a more thorough analysis in case studies) (Yin 1994). Subsequently, a second coder systematically reviewed all codes.

Coding was done in an iterative, two-step process. First, the primary author identified quotes related to broad categories of context, content, actors and process, and extracted this text from the transcripts. Next, the text was further coded to identify barriers or promoting factors of the process of translation within each broad category. A codebook with the barriers and promoting factors within each category, and its corresponding quotes, was created. Initially, the text was coded separately for each sector from which respondents’ were sampled (government, food industry or research sectors), but since similar themes emerged across all three sectors, themes were grouped together. The second independent coder reviewed the codebook and all supporting comments; inconsistencies were discussed and resolved achieving over 80% agreement. Data are presented in text and in boxes using direct quotes.

Results
This section integrates the results from the review of relevant documents and from in-depth interviews; all relevant documents are referenced, and interview citations are presented in boxes. The results section is organized according to the four broad categories presented in the conceptual framework: context, content, actors and process.

Political context
Study participants perceived the political context suitable for discussing policies related to healthy fats and the application of nutrition investigation to policy (Box 1; comments 1.1–1.2). Our review of relevant documents supports this theme: the report on the 2002–2006 National Health Policy of Costa Rica mentions that new monetary resources were allocated to food and nutrition research, and that a new nutrition research committee was created to inform policy about new developments in nutrition investigation and findings (Herrera-Canales 2003). In addition, the 2004–2008 National Plan of Food and Nutrition emphasizes the transference of knowledge: ‘stemming from scientific evidence, a policy and National Plan of Food and Nutrition can be elaborated, formulated and evaluated’ (Secretaría de la Política Nacional de Alimentación y Nutrición et al. 2004).

The visibility of the topic at an international level also appeared to be an important consideration for the translation of knowledge (comments 1.3–1.4). The topic of TFA had been discussed in various Central American countries where government and international agencies had formed partnerships with the food industry to inform the public (comment 1.5). Also, as a member of the international commission of Codex Alimentarius, representatives from the Ministry of Exterior Commerce of Costa Rica had been present in international discussions on the topic of TFA regulation (comment 1.4). Review of relevant documents showed that in addition to regulation in developed countries such as Denmark and the USA, developing countries other than Costa Rica were considering TFA regulation (Codex Alimentarius Commission 2005).

At the national level, nevertheless, the topic had very little visibility among the public and the national media (comment 1.6), and the specific topic of TFA had not been identified as a priority in the national agenda (comments 1.7–1.8).

Content: scientific evidence
Our findings suggest a lack of awareness of in-country scientific studies (Box 2; comments 2.1–2.3) and the perception
that the available scientific evidence lacked information on daily Costa Rican TFA intake, making it therefore inadequate for policy recommendation (comments 2.4–2.5). Furthermore, some informants mentioned that available scientific studies did not offer conclusive evidence about TFA (comments 2.6–2.9); representatives from the food industry in particular mentioned that regulation could not happen because science had not yet established a safe level of TFA consumption (comments 2.8–2.9). Others perceived that scientific evidence about TFA was too recent and needed more investigation before it could inform a regulation (comments 2.10–2.11).

Content: information about policy options

Emergent themes in this category suggest a lack of consensus and little information regarding effective policies to regulate TFA (Box 3; comments 2.12–2.13). For example, there was a lack of information (comment 2.14) on a regulation to establish a maximum permissible level of TFA intake, and lack of agreement that this regulation could be effectively implemented (comments 2.15–2.16). Others were concerned about the potential impact of this regulation on national (comment 2.17) and international trade (comment 2.18) and lacked information on the subject.

The option of labelling the TFA content in food products appeared to raise controversy among respondents. Some informants expressed their concern that the costs incurred in nutrition labelling would surpass their sales, since consumers may not read the labels (comment 2.19); and yet others perceived that even if consumers read the labels, they would not understand them (comments 2.20–2.21). An internal document published by INCIENSA supported this perception, showing that a very low percentage of Costa Ricans read or understand nutrition labels (Blanco et al. 1998; Hernandez-Grabanzo et al. 1998).

Another popular strategy to help regulate TFA was to launch a public health and education campaign for the public. Labelling, for instance, would need to be accompanied by an education campaign directed at the public. However, others were concerned that such a campaign would detract attention from larger nutrition problems, creating a culture that branded fats as evil and/or one that confused the public (comments 2.23–2.24).

Actors: attitudes and characteristics

Distrust or lack of credibility across sectors (government, food industry and research sectors) was the main theme that emerged from this category (Box 4; comments 3.1–3.7). A second theme was differential attitudes toward the topic of TFAs by sector: among government officials, the topic was alarming and informants thought that it merited careful consideration, whereas among food industry informants and some researchers, the topic was considered of little consequence to Costa Rica (comments 3.8–3.10).

The last identified theme was the controversial role of international entities. On one hand, international sources of scientific evidence were quoted as reliable sources of information (comment 3.13) and the presence of international bodies provided extensive credibility to initiatives (comment 3.11). For example, even though Costa Rica is ultimately sovereign in its decisions and not subject to the recommendations of Codex Alimentarius, the fact that this international committee had not issued any statements at the time about TFAs (Codex Alimentarius Commission 2005) was seen as a barrier to knowledge translation. Even though Codex does determine food policy, national criteria for domestic and imported food products are based on Codex guidelines (Codex Alimentarius Commission of Costa Rica 2005). While a few informants believed the lack of a Codex guideline should not...
Box 2 Content: scientific evidence about trans fatty acids and health

Informants are not aware of Costa Rican studies
2.1 In Costa Rica, there are no studies about consumption of trans fats. The only information is obtained through the Internet and studies from the US and Europe. (Industry representative)
2.2 Trans fat content of foods has not been established, at least not for Costa Rica or adjusted for Costa Rica. (Researcher)
2.3 Not for Costa Rica [there are no food composition tables]... (Government official)

Scientific evidence lacks information on Costa Rican dietary behaviours
2.4 [...] knowledge [about trans fats] here doesn’t mean anything if you don’t know the people’s behaviour towards food, right? (Researcher)
2.5 [...] we wanted to have more conclusive data from Costa Rica on the amount of fatty acids that exist in fat, in oils [...] what is the real food consumption, the Costa Rican nutrition pattern [...] what trans fatty acids are being consumed [...]. (Government official)

Scientific evidence is not convincing and needs further confirmation from more studies
2.6 We’re assuming that when we decrease trans, its effects are reduced, but it doesn’t happen exactly like that [...] if I said, by having all identical conditions and changing trans I can lower heart attacks, then I’d say we’re right to change trans. (Researcher)
2.7 Many of these correlations [between trans fats and disease] require more scientific investigation to confirm them. (Industry representative)

Scientific evidence leaves important knowledge gaps
2.8 To date there is no scientific evidence that will indicate a maximum allowable level of trans fat consumption. (Industry representative)
2.9 There is no clear information that the effects of trans are more harmful than those of saturated fats. [...] there is no information regarding maximum allowable consumption of trans. (Industry representative)

Scientific evidence is too recent and has not generated a reaction yet
2.10 [Trans fats] is a developing topic and there will be a time when it will have resources but at this moment it does not have them. (Government official)
2.11 Specifically, trans is a very new aspect worldwide [...] the theme of trans fatty acids at global level is a project that is currently in the process of investigation. More investigation is needed. (Industry representative)

inhibit policy setting, the general impression expressed by most study participants was that adopting a TFA regulation in Costa Rica was rendered more difficult by the absence of a Codex guideline (comment 3.12). Interviewees across sectors had the notion that Codex perhaps could have facilitated the knowledge-translation process by setting an international standard that could be easily adapted to each country. Similar observations have been made in other emerging economies, such as Mexico and Lao PDR, where international endorsement and support are perceived as essential promoting factors in policy making (Trostle et al. 1999; Tomson et al. 2005).

Conversely, the role of international agencies may also act as a barrier to the process if they are perceived as out of touch with the domestic reality, as our results suggest (comment 3.14). This is an important observation given that most TFA research pertaining to Costa Rica was done in partnership with a foreign university.

Process: collaboration and communication between actors
Emergent themes in this category suggest a positive collaboration experience between government entities and the food industry (Box 5; comments 4.1–4.2). This finding was supported by documents describing the active participation of representatives from private food companies in various government committees, including the ‘Fats and Oils Subcommittee’ of Costa Rica’s Codex Alimentarius (Secretaría de la Política Nacional de Alimentación y Nutrición et al. 2004; Codex Alimentarius Commission of Costa Rica 2005; Parral 2005b). Cross-sector coordination of government subcommittees may be assumed by representatives of public institutions, such as the Ministry of Economy, Industry and Commerce, or by those working in the private sector. Although not explicitly stated during the interviews, we speculate that the food industry influenced TFA policy setting through active participation in such committees, especially in Codex, which incidentally also had few representatives from academia and the Ministry of Health. Because criteria for Costa Rican domestic and imported food products are based on Codex recommendations, active participation from these two sectors is needed in Codex committees (Codex Alimentarius Commission of Costa Rica 2005).

In addition, some informants spoke of limited collaboration between researchers and government, possibly attributed to lack of interest from policymakers in research initiatives and lack of participation by investigators in the policy-making process (comments 4.3–4.5). The next three emergent themes suggest the following barriers to collaboration: discrepant expectations beyond the expertise of different sectors (for example, investigators were expected to get involved in policy making, and government officials were expected to be informed in science) (comments 4.6–4.7); limited dissemination of research findings (comments 4.8–4.10); and difficulties in communicating scientific or technical findings in lay terms to other actors (comments 4.11–4.12).
Box 3 Content: information about policy options

**Little information on an effective nutrition policy**

2.12 [Researcher] never gave us a concrete response [about the maximum permissible level of trans fatty acid intake]. (Government official)

2.13 The information needed [is to explain] what would be the cost of these actions [to label or regulate trans fats] and the benefits. (Government official)

**Regulation by decree of trans fatty acid content in foods sold in Costa Rica**

2.14 [All efforts of Ministry of Health to establish a decree were] abandoned at the point of needing to define a limit of trans fats that a person can consume. (Researcher)

**Lack of surveillance system to verify implementation of potential regulation**

2.15 The State can promote to remove trans fatty acids, [but] how does the State control it? Does Costa Rica have the necessary tools to [...] verify if [foods] contain trans fatty acids? I know it doesn’t. (Researcher)

2.16 The country is over-regulated, there are many technical regulations that are established but not verifiable because the country, let’s say, doesn’t have the means. (Government official)

**Potential interference with national and international trade**

2.17 [For] the large industries that [...] have economic access to make the changes, it will be a lot easier and lot simpler, but there are small enterprises that do not know how to do it [reduce trans fatty acid content in foods]. (Researcher)

2.18 WTO will try to block the supposed use of sciences as an excuse to eliminate a product, because it creates barriers in the commerce with other countries and other products. (Government official)

**Nutrition labelling of trans fatty acids in food supply**

2.19 We’ve made two different types of packaging because the requirements are different in each country [for exporting to US, and for Costa Rica]...we have over 350 products and a change in labelling of one [product] would cost more than $5000 [...]. (Industry representative)

2.20 I think that the labelling, people still do not take advantage of it; and the fact that it would say free of trans or that [it] has so much quantity of trans, maybe it will not have much impact in the population. (Government official)

2.21 The fact that it is in the label will not serve for absolutely anything if people do not know what it is for [...]. (Researcher)

**Public health campaign about trans fatty acids**

2.22 It has to be information that does not create scandal. (Researcher)

2.23 The use of oils and fats in the diet cannot be made evil, because they are essential for the body and cannot be eliminated from the diet without sacrificing nutrition. (Industry representative)

**Discussion**

The study of the translation of scientific evidence into action is crucial in the identification of factors that impede or promote this process, and can provide a template for other emerging economies that wish to establish nutrition- or health-related policy. This study used descriptive, single case-study methodology to examine the process in the specific context of TFA research and policy action in Costa Rica. The findings suggest that even though the political context seemed suitable to discuss healthy fats and diet, the specific topic of TFA had not been discussed and was not part of the political agenda. Our observations indicate four potential reasons for this: (1) lack of awareness of scientific studies specific to Costa Rica; (2) lack of consensus about the best policy option, and little information on the different options; (3) distrust and disparate attitudes between sectors; and consequently, (4) little collaboration between sectors.

Although in other countries epidemiologic research about TFA has been used to help guide national policy (Korver 1997; Hulshof et al. 1999; Lichtenstein 2003; Stender and Dyerberg 2004), the case of Costa Rica suggests that research in itself was insufficient to drive the policy-making process. Our results are consistent with previous observations that the mere existence of research is insufficient to achieve policy change (Kogan and Henkel 1983; Henkel 1986; Frenk 1992; Davis and Howden-Chapman 1996; Trostle et al. 1999; COHRED Working Group on Research to Action and Policy 2000; Innvær et al. 2002; Lavis et al. 2002; World Health Organization 2002; Tomson et al. 2005; Ashford et al. 2006).

Studies on policy making have identified three broad phases of the process: agenda setting, policy formulation, and policy implementation (Gilson et al. 2000; Lavis et al. 2002). In the following sections, we describe barriers to each one of these phases.

**Phase 1: Agenda setting**

Reich (1995) has described political agenda setting as a convoluted process in which many streams and interests compete for attention. Similarly, Altheide and Johnson (1998) propose that the establishment of issues in the political agenda depends on the level of attention that the topic has generated among a critical mass of politicians, special interest groups and the media. In the case of Costa Rica, our findings suggest that the topic of TFA had generated little attention among government officials, the public or the media. Even though scientific evidence about TFA had been
accumulating for more than two decades, it seemed that informants were unaware of this, or considered it to be fairly recent. Knowledge of relevant evidence does not necessarily result in setting the topic on the political agenda; nevertheless, lack of awareness of research studies and lack of debate about scientific evidence have been noted as barriers to the use of evidence to inform policy (Innvaer et al. 2002; Petticrew et al. 2004; Armstrong et al. 2006).

A second barrier may be disparate attitudes about the relevance of TFA intake in Costa Rica; some informants expressed that this was not an important nutritional concern for Costa Rica and other developing nations, and that placing TFA in the political agenda would rob resources and attention from more pressing nutritional concerns. Bucuvalas (1978) and Weiss and Weiss (1981) have argued that research is least likely to be utilized if it raises controversy or criticism. In the case of Costa Rica, informants’ disparate opinions about the timeliness and relevance of the topic may have raised controversy and acted as a barrier to agenda setting. Perhaps if the issue had garnered the endorsement of an international agency, such as Codex or the World Health Organization/Pan American Health Organization, which traditionally play an active role in guiding domestic policy of emergent economies, TFA would have been set on the agenda, as other countries have documented (Trostle et al. 1999; Tomson et al. 2005). However, involvement of academicians and Ministry of Health policymakers in these committees is crucial in guaranteeing that the topic is set on the agenda.

Previous literature has documented the importance of personal contact between researchers and policymakers in facilitating research utilization (Elliott and Popay 2000; Innvaer et al. 2002; Petticrew et al. 2004; Choi et al. 2005; Armstrong et al. 2006). Hanney et al. (2003) have also observed the significance of interactive arenas where researchers, policymakers and special interest groups actively engage in committees, share research findings and exchange perspectives. These arenas should help advance better understanding of other sectors’ motives, time constraints, economic and career incentives, dissipating the distrust and credibility issues that we observed among actors and across sectors, and promoting collaboration. Previous qualitative studies on policy making have noted that spaces for interaction between researchers and other actors can successfully create networks that promote research initiatives and facilitate setting a topic on
the agenda (Husen and Kogan 1984; Buxton and Hanney 1996; Trostle et al. 1999).

The participation of researchers in these interactive arenas and political committees is crucial (Davis and Howden-Chapman 1996; Hanney et al. 2003). Consistent with our observations, previous studies have also noted that lack of time, interest and difficulty in communicating scientific findings may act as barriers for research engagement (Miller et al. 2006). Traditionally, investigators are not rewarded for participation in policy forums (Hanney et al. 2003). Therefore, Henkel (1986) and Frenk (1992) have separately proposed that governments should play an important role in offering incentives to researchers so that they can assess the advancement of their career and obtain peer recognition according to the amount of participation in their research utilization. Particularly in developing countries, where decision-making committees are small, researchers may be expected to step out of their investigative roles and participate fully in policy committees, as Trostle et al. (1999) found in Mexico, and as our findings suggest. Involvement of scientists in the process of policy making is insufficient, however, to guarantee influence on the policy agenda (Innvaer et al. 2002; WHO 2002; Ashford et al. 2006). The policy-making process is necessarily non-linear and iterative, and scientific evidence is just one of several factors that may influence setting topics, such as TFA regulation, on the policy-making agenda in different contexts (Margetts et al. 2001; Hanney et al. 2003).

Policymakers, in turn, are also responsible for considering, understanding and qualifying research evidence (Ham et al. 1995), especially because they are regarded, as in the current study, as ultimately responsible for providing systems that protect and inform the public. This is an important issue across countries; the World Health Organization is now strongly suggesting that decision makers have research experience and scientific interests as part of their formal education training (Hanney et al. 2003). Providing an arena for interface also facilitates research exchange with policymakers. In the United States and Europe, consensus meetings are convened between scientific players and those with divergent opinions; a consensus is reached and a meeting report is issued by a credible, neutral organization, usually the government. It is important for the government to show its neutrality and enforce regulations (Korver 1997).

In concurrence with the policy-making literature, our findings suggested that competing health priorities and economic issues related to costs of feasible policy options also contributed to agenda setting in Costa Rica. Such factors are known to permeate all phases of health policy formulation and implementation (Hanney et al. 2003; Ashford et al. 2006).
Phase 2: Policy formulation
Researchers have identified a lack of consensus and information on a feasible solution as hindrances to policy formulation (Hanney et al. 2003). In Costa Rica, there was little agreement about a potential TFA policy solution. To our knowledge, no information was available about the cost-effectiveness of different regulatory options. Policy formulation could benefit from ad-hoc committees or task forces that examine literature on previous experiences from other countries and offer examples about various policy strategies for regulation in the context of Costa Rica. This commission could draw from international examples and literature to design strategies for the regulation of industrially made TFA according to the country-specific reality. For instance, it could consider Denmark’s 2004 legislation, which mandated a maximum permissible intake of industrially made TFA at 2% of all sources of oils and fats (Hulshof et al. 1999); or, as Mozaffarian et al. (2005) recommended, consumption of TFA at less than 0.5% of the total energy intake. It could also draw examples from the United States, which legislated that all pre-packaged food products must declare TFA content in the label, giving the consumer the option to make an informed choice, but also leaving the door open for high TFA content in non-packaged foods. Other examples could be reviewed, such as that of the European Union directive, which declared, but did not mandate, that nutrition labelling can include TFA content (Stender and Dyerberg 2004). A nutrition label strategy such as the latter could also be accompanied by information campaigns with simple messages that are efficient for public health promotion (Lichtenstein 2003). A systematic review of these strategies could support movement into policy formulation in the Costa Rican context.

Another barrier to policy formulation was a lack of awareness of scientific evidence and the perception that this evidence was unconvincing and needed further confirmation. Reports from the US, Great Britain and Denmark document similar experiences when scientific data about TFA was first considered in the late 1980s as a target for potential legislative action (Stender and Dyerberg 2004). In these settings, policymakers were unconvincing until a nutrition task force presented updated reviews of scientific literature on TFA to special policy-making committees. A similar strategy could be adopted for Costa Rica.

Phase 3: Policy implementation
Although a policy had not yet been considered at the time of the interviews, informants foresaw potential problems with policy implementation and enforcement that might have affected their perspective on TFA regulation. Our findings suggest that at the time of the interviews, the country did not have a monitoring system in place to enforce legislation. Some government informants mentioned that the Ministry of Health lacked the capacity to enforce any nutritional policy, including implementing and enforcing legislation to support unbiased monitoring of nutrition labelling and standards for domestic and imported products. However, several other respondents mentioned that there already existed laboratory capacity to verify food contents. More information about resources available for various policy options may further the process of policy implementation.

Even though policy was not implemented, food industries acted voluntarily to reduce TFA content. According to the interviews, their reasons for this were twofold. Industry respondents wanted to enhance their brand value and product without sacrificing cost or flavour; in previous attempts to eliminate TFA, consumers disliked the taste of affected products. Secondly, study participants anticipated greater public awareness of TFA and prominence in the Costa Rican media in light of recent TFA policy developments in the United States. It is in the best interest of food companies to communicate the nutritional benefits and qualities of their products in order to avert costly damage to their brand value and company credibility (Korver 1997). In Australia, Norway, Finland and The Netherlands, TFAs have been voluntarily withdrawn from many popular oil and margarine brands, perhaps as a result of international trading pressures (Aro 2005; Baylin et al. 2007). However, government and food industry action is still crucial to ensure low consumption of TFA, since one of our respondents mentioned that a small percentage (about 2%) of Costa Rican cooking oil clients specifically requested partially hydrogenated oils for their fast food restaurants.

Conclusion
This study comes at an important time when several developed countries have taken steps to regulate industrially made TFA content in foods, translating scientific evidence about TFA into policy action. The findings from this study may shed some light on this process in the context of developing countries.

Findings from this qualitative study are specific to Costa Rica, which may be characterized as having greater economic progress and human development than its Central American counterparts. Nevertheless, the methods and emergent themes may provide a template relevant to other emerging economies that are considering TFA regulation or more general nutrition policy regulations, particularly in Latin America. Appropriate adaptations should be made to accommodate the different contexts and actors in other countries.

In Costa Rica, where there is country-specific evidence about the negative effects of TFA, the specific topic of TFA had not been identified as a priority in the policy agenda at the time of the study. Barriers such as lack of awareness of scientific studies, lack of consensus on an optimal policy and limited information about these policy options, disparate attitudes about the importance of the topic, and little collaboration between sectors, impeded setting the topic on the agenda and affected the formulation and implementation of potential policy strategies. Organizational infrastructures such as commissioned task forces that review literature or arenas that allow for interaction between sectors could facilitate systematic collaborations between government, food industry and researchers, and are crucial for the consideration of nutrition policy regulations in this and other developing countries.
REFERENCES


### Appendix 1: Sample of open-ended interview questions

#### Knowledge of trans fats

- Can you explain to me what are trans fats?
- According to studies in Costa Rica, partially hydrogenated soybean oil is the main source of trans fats. Do you know when this oil started to be consumed in Costa Rica?
- Were you aware of a reduction in the levels of trans fats in soybean oil?

#### Actor’s role and attitude toward topic

- Do you consider it important to have information about the content of trans fats in foods?
- Has your institution/organization been involved in the discussion of the health effects of trans fats?

#### Perception of scientific studies

- In which way have you become aware of the topic of trans fats?
- Do you believe that we have enough information to make a policy recommendation about fat consumption?

#### Perception of policy action

- In your opinion, should something be done about products that contain trans fats in Costa Rica?
- What could be done to reduce the consumption of trans fats?

#### Barriers that impede or promote the process and collaboration

- Do you know if any actions have been taken to diminish trans consumption?
- What may have facilitated (or impeded) actions to diminish trans consumption?
- What do you consider would be necessary for these actions to take place?