Global Health Advocacy Incubator

Partially Hydrogenated Oil (PHO) Market Mapping

Identifying Sources of Industrially Produced Trans-Fatty Acids in the Food Supply

The consumption of trans-fatty acids has been linked to heart disease, causing avoidable death and disease in all regions of the world. Most trans-fatty acids in the food supply are industrially produced (known as iTFA), and created through the process of partially hydrogenating oils. Such oil – referred to as PHO – contains dangerous levels of iTFA, yet is used in a wide variety of products.[i]

The World Health Organization (WHO) has prioritized the global elimination of iTFA by 2023.[ii] To achieve this goal, WHO has called on governments to enact mandatory measures – such as laws, regulations, or compulsory standards – to eliminate iTFA from national food supply chains. It considers two approaches to be best practice: limiting iTFA to 2g per 100g of total fat (also referred to as a "2% limit"), and banning PHO.[iii] The goal of both types of measures is to eliminate iTFA from the food supply. WHO has provided guidance to countries on how to achieve this goal in the REPLACE action package.[iv]

The Global Health Advocacy Incubator (GHAI) works with civil society and government partners around the world to develop strong and enforceable iTFA measures. Mapping a county's PHO market is an important component of this work. Food supply chains – and how PHO enters and moves through such supply chains – can vary significantly from country to country. Mapping the PHO market can help to determine which type of WHO-recommended iTFA measure is a good fit for a national context. PHO mapping can also help to determine what types of monitoring and enforcement schemes may be most effective and should be written into the measure and implemented. For example, if mapping suggests that most PHO enters a national food supply via one or two large, domestic PHO producers, then government can ensure that adequate resources are allocated to monitoring those producers for compliance.

It is important for those conducting or commissioning PHO market mapping to understand what PHO is and why it needs to be differentiated from other fats and oils. Moreover, PHO markets can be complex and involve many actors that do not self-identify as PHO producers, such as large manufacturing companies that partially hydrogenate oil for use as an ingredient in their packaged food products. This document is designed to fill gaps in understanding, and encourage PHO market research.

This document includes:

1. Information about what PHO is;
2. A PHO market diagram illustrating potential key players and products across the supply chain; and
3. Guidance for developing PHO market research, including a recommended methodology and key questions.

We suggest using this tool in conjunction with the GHAI guide "Key considerations for regulating trans fat,"[v] which contains more detail on ways to use PHO market data to inform the development of strong TFA measures. Other useful resources include two sampling protocols GHAI developed with Resolve to Save Lives for the rapid assessment of TFA in fats, oils and foods.[vi]

1. What is PHO?

PHO is industrially produced trans fat formed through a process that adds hydrogen to vegetable oil, converting the liquid into a solid. PHO was introduced to the food supply in the early 20th century as a replacement for butter and lard because of its capacity to prolong the shelf life of products. It is primarily used for deep frying and as an ingredient in baked goods.[vii]

2. PHO market diagram

A variety of players may be part of the PHO market, and PHO may take several pathways to enter the market and move to the point of sale. The PHO supply chain can be segmented into three tiers:

- **Tier 1:** manufacturers and importers – the original sources of PHO in the national food supply chain
- **Tier 2:** entities that buy and sell PHO, but do not produce or import it
- **Tier 3:** products that contain PHO and are available to consumers

The PHO market can differ significantly from country to country. The following diagram is meant to help inform PHO mapping by showing types of players and products that might be relevant for PHO-market research, along with various potential pathways that PHO may take through the supply chain. Following the diagram are examples of the potential players and products with brief explanations.

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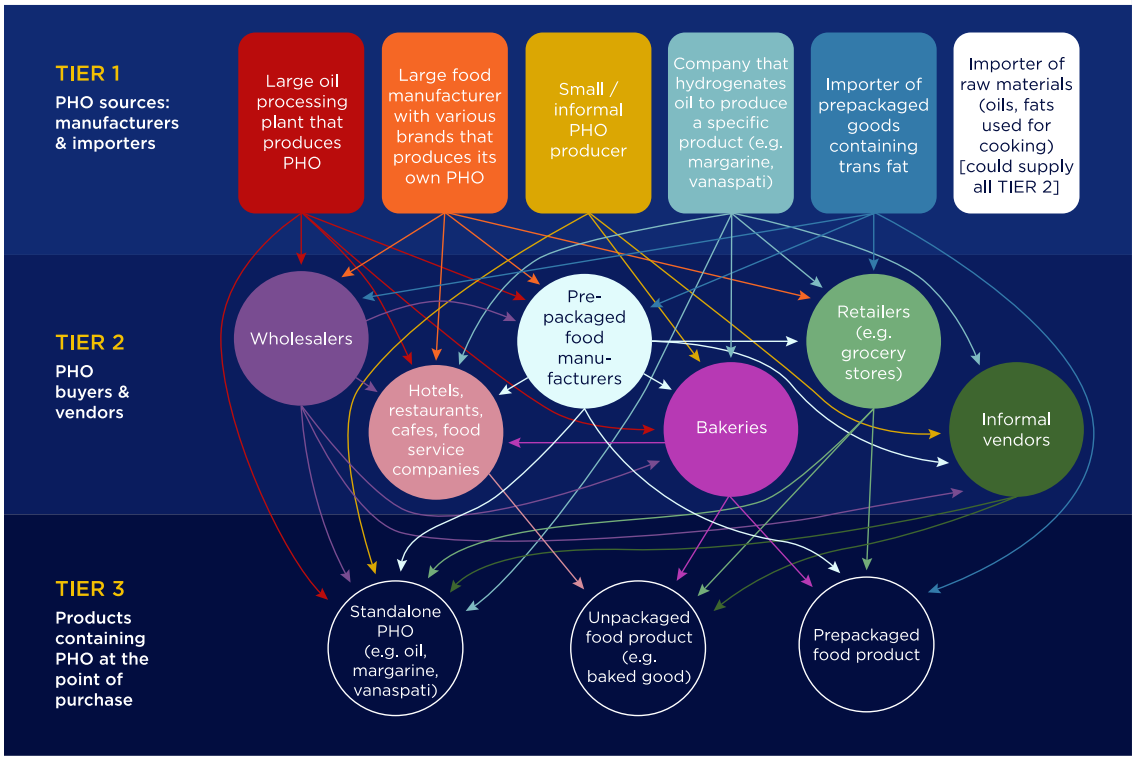
MAPPING THE PARTIALLY HYDROGENATED OIL (PHO) MARKET

Potential key players and products across the food supply chain



Tier 1: PHO sources (manufacturers and importers)

Examples of types of players:

- **Large plant that processes oils**, including PHO for wholesale or retail. This plant may sell to wholesalers, food manufacturers, bakeries, cafes, restaurants, hotels, food service companies, retailers, etc.
- **Large food manufacturer** that partially hydrogenates oil for use in its own products, and/or to sell PHO as a standalone product. This may be a large company with multiple brands such as baked goods, breakfast foods, margarines, etc. It may sell products containing PHO to wholesalers, food manufacturers, bakeries, cafes, restaurants, hotels, food service companies, retailers, and consumers (if vertically integrated).
- **Smaller manufacturers** of PHO that may sell to bakeries, smaller food manufacturers, retailers, street food vendors, or other informal vendors.
- **Producers of specific oil or fat products** that partially hydrogenate their own oils. For example, in some countries, this could be smaller companies that manufacture

vanaspati, shortening, margarine, etc. They may sell to wholesalers, retailers, consumers, street food vendors, or other informal vendors.

- **Importers of prepackaged foods** that may sell prepackaged foods containing PHO to retailers, wholesalers, or other vendors of prepackaged food.
- **Importers of PHO** that may sell to any player in Tier 2.

Tier 2: PHO buyers and vendors

Examples of types of players:

- **Wholesalers** of oils, fats and prepackaged foods

  They may buy PHO in the form of standalone PHO fat (such as margarine), or in manufactured products such as prepackaged foods or ingredients that include PHO.

  They may sell products to informal markets, restaurants, hotels, cafes, food service companies, prepackaged food manufacturers, and grocery stores.

- **Informal vendors**, such as street food vendors and informal markets

  They may buy PHO in the form of standalone PHO (such as margarine) to use in a variety of ways, including in: foods made and sold on the premises; manufactured products, such as pre-made goods to finish cooking on the premises or to sell on the premises as-is; and goods prepared on the premises to sell to bakeries, restaurants, cafes, vendors, and other resellers. They may also buy PHO in the form of manufactured products, such as pre-made goods to finish cooking on the premises or sell as-is.

  They may sell products to individuals, restaurants, hotels, cafes, food service companies, and other local vendors.

- **Hotels, restaurants, cafes, and food service companies (e.g. caterers)**

  They may buy PHO in the form of standalone PHO (such as margarine) to use in foods made and sold on the premises, or foods made on the premises and delivered to individuals, market vendors, or others. They may also buy PHO in the form of manufactured products, such as pre-made goods to finish cooking on the premises or sell as-is.

  They may sell products to individuals, wholesalers, prepackaged food manufacturers, and market vendors.

- **Bakeries**

  They may buy PHO in the form of standalone PHO (such as margarine) to use in goods that are baked and sold on the premises, baked on the premises to sell to wholesalers, and baked on the premises to sell to other bakeries, restaurants, cafes, vendors, and

other resellers. They may also buy PHO in the form of manufactured products, such as pre-made dough, pre-made assembled goods to bake on the premises, and complete products to sell as-is.

They may sell products to individuals, hotels, restaurants, wholesalers, other bakeries, prepackaged food manufacturers, and market vendors.

- **Prepackaged food manufacturers**

  They may buy PHO in the form of standalone PHO (such as margarine), and in other ingredients that contain PHO that are used to manufacture products.

  They may sell products to individuals, informal markets, restaurants, hotels, cafes, food service companies, other local vendors, prepackaged food manufacturers, and grocery stores.

- **Grocery stores**

  They may buy PHO in the form of standalone PHO (such as margarine) that are sold as prepackaged and branded fats or oils, used in food made and sold on the premises, and goods prepared on the premises to sell to bakeries, restaurants, cafes, vendors, and other resellers. They may also buy PHO in the form of manufactured products to sell on the premises as-is, and in manufactured products that require assembling, cooking, or otherwise completing on the premises.

  They may sell products to individuals, restaurants, hotels, cafes, food service companies, and other local vendors.

Tier 3: Products available at the point of sale

Examples of types of products:

- **Standalone PHO** is partially hydrogenated oil as a raw ingredient that is semi-liquid, semi-solid or solid (e.g. margarine, vanaspati, or shortening). It can be prepackaged and branded or unbranded and sold in containers at an informal market.
- **Food products containing TFA** (specific products must be determined for each country) such as prepackaged and unpackaged food products sold to the end consumer.

3. Guidance for developing PHO market research

PHO market mapping can help to identify sources of PHO in a country's food supply chain, quantify the size of the PHO market, and describe how PHO moves through the supply chain to the point of sale.

Tier 1 is the main focus for conducting PHO market mapping because it provides a foundation of information about how – and how much – PHO enters the food supply chain. However, it is helpful for those commissioning and conducting research to consider all tiers of the supply chain when designing PHO market research. This is important for ensuring that sources of PHO are not omitted, which can be particularly challenging since PHO producers may not self-identify in those terms. Moreover, a holistic view of the supply chain helps to ensure that PHO market research is aligned with other potential research projects, such as the sampling of end products to test their TFA levels. (Refer to the sampling protocols GHAI developed with Resolve to Save Lives for the rapid assessment of TFA in foods[viii] as well as in fats and oils;[ix] both outline key steps to collect samples for TFA chemical analysis.)

For these reasons, the focus below is on Tier 1. However, guidance is provided for all three tiers, including on the type of information which may be gathered about each tier, and potential uses for such information.

Tier 1

Analysis of Tier 1 will provide information about how PHO enters a country's food supply – including whether this occurs through nationally produced products, imported products, or a combination of the two. It should also reveal whether PHO is entering the food supply as a standalone product, or whether it enters the food supply as an ingredient in other products – such as in imported prepackaged goods, or in baked goods made domestically by companies that partially hydrogenate their own oils. This type of information is critical for choosing an appropriate type of iTFA measure, and to draft appropriate monitoring and enforcement mechanisms for the measure. To understand how to use PHO mapping to inform the choice and design of iTFA measures, refer to GHAI's guide "Key considerations for regulating trans fat."

Key questions about Tier 1 players:

1. Of the examples shown in the diagram, which of these players exist in the country? Are there other players that could be sources of PHO or iTFA?
2. How many of each kind of player are there?
3. What is the PHO production market share size by each player?
4. How many products containing PHO or iTFA do they manufacture or import?
    a. What kinds of products are these (eg. raw materials, packaged, for cooking, manufacture, or consumption)?

5. To whom do they sell their PHO or iTFA-containing products? What proportion of their products does this account for?
6. What proportion of PHO-containing products on the market does this account for (if that is possible to find out)?
7. What is their geographic reach?
8. Do they produce products for export?
9. Are importers aware of whether there is iTFA in products? If so, how is this verified?
10. What alternative healthier fat/oil options are being implemented or considered?

Methodology for PHO market research (focus on Tier 1 players):

The following should be taken into account when considering whether to conduct PHO market mapping in-house or commissioning it to a research firm: ability to access information, including through private databases, public documents and industry representatives; knowledge of TFA and partial hydrogenation science; experience with market and industry investigative research; experience with qualitative research and analysis.

Below are recommended procedural steps for PHO market mapping, with output for each methodology.

I. Secondary research (desk review)

A. **Draw from existing data sources** to identify all players who manufacture and import PHO in the country. This includes manufacturers (e.g. large, midsize, small, and informal) and importers of PHO as a standalone product, and PHO as an ingredient in other products (eg. PHO as an ingredient in prepackaged biscuits).

Seek information from sources such as business directories, trade associations, market research databases (e.g. Euromonitor, GlobalData), food/drug and agriculture authorities, chambers of commerce and industry, customs authorities, websites of oil processing companies and food manufacturers, published articles, and grey literature.

B. Using the suggested sources, particularly market research databases, **identify the market size of edible oil** (e.g. oil used for cooking, food preparation and consumption) generally, and PHO specifically (e.g. including market size of PHO as raw material and ingredient in products).

C. **Output from secondary research**: Generate a database listing the identified domestic oil manufactures, food manufactures, and imported oil and food manufactures; specify if the listed companies partially hydrogenate. Where possible, populate a spreadsheet with descriptive data for each company (e.g. address/city/state/country, products they manufacture, brands, size of their market, etc.). This database will not only quantify the number of PHO manufacturers and players and provide descriptive data; it should also be used to inform the sampling design for primary data collection in key informant interviews.

II. Primary research

A. **Key informant interviews** should be conducted to address questions about the PHO market that could not be answered through desk review and to triangulate and substantiate what was found in the desk review.

When determining the sampling design for the key informant interviews, data from the desk review should be used to inform who to interview. At least one of each type of PHO manufacturers and players identified should be interviewed (e.g. large oil manufacturer, medium/small oil manufacturer, large food manufacturer, medium/small food manufacturer, importer).

Additionally, consideration should be given to interviewing knowledgeable government entities (e.g. FDA, Ministry of Health, Customs) or industry associations. The number of interviews conducted will be dependent on budget; however, a company's market size, unique food manufacturers such as the bakery industry, a manufacturer's location in the country and their distribution channels should be used to inform the selection of a diverse and representative sample of key informants.

B. **Questionnaire development** for the key informant interviews should address each of the key questions about PHO sources. Additionally, the questionnaire should seek to ascertain the informant's understanding of what PHO is. It is imperative that the information being collected through the interview is specific to PHO and not edible oils in general.

The questioning style should be open-ended and include follow-up probes that encourage detailed explanations, providing specifics about the what, how, and why. Learnings from the desk research should be integrated into questions so the informant can validate or clarify the accuracy of that information.

Some informants may occupy multiple roles in Tier 1 (e.g. they may be a large oil manufacturer, a food manufacturer, and an PHO importer). It is best to structure the questionnaire in sections by PHO source type. Informants should be asked the specific functions or roles they occupy and asked questions which pertain to each one.

C. **Analysis**: After interviews are transcribed, a codebook may be used to conduct analysis of each interview and identify emergent constructs for each response to a key research question. Thematic analysis should be carried out to capture common themes within groups of PHO players (e.g. oil manufacturers, food manufacturers) and across the groups. Patterns as well as new ideas should be captured. Rival or dissenting explanations should be documented.

D. **Output from primary research**: The final questionnaire should be shared with research and advocacy stakeholders for input. Memos or a report describing how each interview was coded and analyzed should be prepared to document and explain the process. Transcription of the interviews should be made available if requested. Strong, illustrative quotes that explain answers to the 10 key research questions should be codified into a master document to be used to support conclusions about the research.

III. Results and deliverables

A. **Integrated analysis** – information drawn from the secondary and primary research – should be used to make conclusive result statements about this body of work. The results should clearly articulate a comprehensive response to the 10 key research questions and describe the sources used, triangulation and secondary verification employed, and overall process and method used to determine results. Supportive quotes, tables, and figures should be included. The results should also acknowledge any limitations that may have impacted conclusion for each question.

B. **Output from the results**: A comprehensive report with background, methods, results and conclusions, and bibliography – which can be shared with advocates, decision makers, and media – should be prepared. Digestible, high-level materials should also be prepared for dissemination. These could include slide decks with appropriate narrative and figures, and 1- to 2-page briefs.

Tier 2

There are times when it may be beneficial to focus mapping efforts at the Tier 2 level. For example, researchers may not be able to identify information about Tier 1 and may turn to actors in Tier 2 to try to identify information about Tier 1. Also, if an iTFA measure is in place but a government is facing monitoring and enforcement challenges at the Tier 1 level, government agencies may look to Tier 2 actors to gather information that can inform their efforts. For example, if a bakery is using PHO as an ingredient, ascertaining who sells it PHO can help government identify players higher up the food supply chain to stop the flow of PHO from its source.

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Key questions about Tier 2 players:

1. Are the Tier 2 players aware that they are purchasing PHO (as a standalone product or ingredient in products)?
2. Do they keep records about the PHO they purchase?
3. Where and from whom do they purchase PHO?
4. How much of each source of PHO do they purchase, and at what frequency?
5. To whom do they sell PHO (as a standalone product or ingredient in products)?
6. How much do the purchasers buy, and at what frequency?

Tier 3

Tier 3 focuses on products that are available to consumers and contain PHO. This tier is included in the PHO market mapping diagram to help illustrate the ways PHO can move through the food supply chain to the point of sale. Information about the amount of TFA in products containing PHO can be obtained by sampling products and testing their TFA levels. This process involves using a sampling protocol that can be adapted to a particular country. GHAI and Resolve to Save Lives have developed sampling protocols for this purpose, for the rapid assessment of TFA in foods and in fats and oils.

It is important to check that product-sampling research is aligned with PHO mapping efforts. Sampling products for TFA levels can help researchers to identify whether PHO market mapping had any gaps. Once high-TFA products are identified, it may be possible to trace how PHO moved through the supply chain to the point of sale in a final product available to a consumer.

Conclusion

GHAI will continue to update this guidance on PHO market mapping and other resources to inform efforts to regulate TFA. If you have any questions, please contact us. Thank you for your interest in this important public-health initiative.

About GHAI

The Global Health Advocacy Incubator (GHAI) supports civil society organizations who advocate for public health policies that reduce death and disease. We bring a proven advocacy approach and a global network of local partners, built on a 20-year track record of success across multiple issues in more than 60 countries.

End notes

[i] A small amount of naturally occurring trans fat can be found in ruminant sources, but this is not considered a public-health risk because it occurs at such low levels.

[ii] WHO included TFA elimination as a key target in its 13th General Programme of Work, which guides the organization's work in 2019-2023. WHO/PRP/18.1 (2019).

[iii] At times, countries have opted for a hybrid of these two types of measures.

[iv] World Health Organization, REPLACE: An Action Package to Eliminate Industrially Produced Trans-Fatty Acids, WHO/NMH/NHD/18.4 (2019).

[v] Global Health Advocacy Incubator, Key Considerations for Regulating Trans Fat, https://advocacyincubator.org/regulating-trans-fat (accessed 28 July 2021).

[vi] Global Health Advocacy Incubator, RTSL and GHAI Release Sampling Protocol for Rapid Assessment of trans-Fatty Acids in Foods, https://advocacyincubator.org/2019/12/12/rtsl-and-ghai-release-sampling-protocol-for-rapid-assessment-of-trans-fatty-acids-in-foods, 12 December 2019 (accessed 28 July 2021).

[vii] World Health Organization, Nutrition: Trans Fat Q&A, 3 May 2018.

[viii] Global Health Advocacy Incubator, Resolve to Save Lives, Sampling Protocol for Rapid Assessment of trans-Fatty Acids in Foods, https://advocacyincubator.org/wp-content/uploads/2020/10/Sampling-Protocol-for-Rapid-Assessment-of-trans-Fatty-Acids-in-Foods.pdf (accessed 28 July 2021).

[ix] Global Health Advocacy Incubator, Resolve to Save Lives, Sampling Protocol for Rapid Assessment of trans-Fatty Acids in Fats and Oils, https://advocacyincubator.org/wp-content/uploads/2020/10/Sampling-Protocol-for-Rapid-Assessment-of-trans-Fatty-Acids-in-Fats-and-Oils.pdf (accessed 28 July 2021).