

REPORT BRIEF • OCTOBER 2006

SEAFOOD CHOICES: BALANCING BENEFITS AND RISKS

Seafood is a widely available, nutrient-rich food that provides high quality protein, low in saturated fat and rich in polyunsaturated fats, and particularly the omega-3 fatty acids eicosapentaenoic acid (EPA) and docosapentaenoic acid (DHA). Research conducted over the past several years suggests that there are benefits linked to eating seafood that include the dietary advantages associated with consuming a low-fat protein source and possible additional benefits linked to brain and visual system development in infants and reduced risk for certain forms of heart disease. Although regular seafood consumption has been linked to health benefits for the general population, contaminants that may be present in seafood may pose a risk to some especially susceptible groups of people.

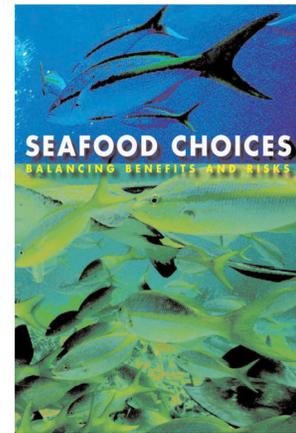
The National Oceanic and Atmospheric Administration (NOAA) asked the Institute of Medicine of the National Academies to review evidence on the benefits and risks associated with seafood consumption to help consumers make informed choices and to make recommendations on ways to guide U.S. consumers in making appropriate selections. Additional support has been provided by the Food and Drug Administration.

CONSUMPTION OF SEAFOOD IN THE U.S.

The consumption of seafood, which here refers to all commercially-obtained fish, shellfish, and mollusks, has increased over the past decades. The 10 types of seafood consumed the most by the U.S. general population are shown in Table 1. The nation's seafood supply is changing, however, and this may have a significant impact on future seafood choices. The preference among consumers for seafood from the oceans is leading to supply deficits and aquaculture is becoming an increasingly important source.

BENEFITS ASSOCIATED WITH NUTRIENTS FROM SEAFOOD

Seafood is a good source of high-quality protein, is low in saturated fat, and is rich in many vitamins and minerals. Seafood is the source of most of the omega-3 fatty acids, EPA and DHA, found in the American diet. While it is uncertain how much these omega-3s contribute to improving health and reducing risk for certain conditions such as heart disease, there is evidence for benefits both to the general population and to some groups of people. The benefit to



U.S. consumers need guidance in making appropriate seafood selections.



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The general population benefits from eating seafood, enjoying reduced risk of heart disease. However, there are a number of contaminants that may be associated with seafood as well.

The consumption of seafood has increased over the past decades.

the general population from eating seafood is reduced risk of heart disease. For those with existing heart disease there may be benefits from consuming EPA and DHA in seafood, although more research is needed in this area. Infants whose mothers consumed EPA and DHA during pregnancy may gain benefits such as longer gestation and better vision and brain development.

RISKS ASSOCIATED WITH CONTAMINANTS IN SEAFOOD

There are a number of contaminants that may be associated with seafood, including chemicals, metals, and other substances as well as potentially harmful microbes. The amount of a given contaminant or hazardous microbe in seafood depends on the type, size, geographic source, and age and diet of the fish.

There is concern about methylmercury (MeHg) because of scientific uncertainty about the potential for long-term ill effects. However, since the developing fetus is at the greatest risk from exposure to MeHg, seafood consumption advice has been developed for and directed to pregnant women rather than the general population. Infants are the most likely to be impacted by exposure to dioxins and polychlorinated biphenyls (PCBs), which concentrates in the fatty tissue of fish. It is also a concern for people who consume seafood they catch themselves which is not subject to commercial regulation, although levels of these contaminants in the environment have been decreasing over the past several decades.

Reported numbers of illnesses from seafoodborne microbes have remained steady over the past several decades. Exposure to *Vibrio*, a bacterium that contaminates raw oysters and causes illness, and norovirus infection is still a concern, however, as is consumption of raw molluscan shellfish. Steps to take to minimize the risk of seafoodborne microbial illnesses include avoiding types of seafood identified as being more likely to be contaminated, and following general food safety guidelines, e.g., proper cooking.

TABLE 1. National Marine Fisheries Service Disappearance Data Ranked by Seafood Type for 2004 and 1994, Based on Disappearance Data

Rank	Fish	2004	Fish	1994
		Estimated Per Capita Consumption (pounds)		Estimated Per Capita Consumption (pounds)
1	Shrimp	4.2	Canned Tuna	3.3
2	Canned Tuna	3.3	Shrimp	2.5
3	Salmon	2.2	Pollack	1.5
4	Pollock	1.3	Salmon	1.1
5	Catfish	1.1	Cod	0.9
6	Tilapia	0.7	Catfish	0.9
7	Crab	0.6	Clams	0.5
8	Cod	0.6	Flatfish	0.4
9	Clams	0.5	Crab	0.3
10	Flatfish ^a	0.3	Scallops	0.3

NOTE: The figures are calculated on the basis of raw, edible meat, that is, excluding such offals as bones, viscera, and shells. Excludes game fish consumption.

^a Includes flounder and sole

SOURCE: National Fisheries Institute (http://www.aboutseafood.com/media/top_10.cfm)

ANALYSIS OF BENEFITS AND RISKS

Advice to consumers about balancing the benefits and risks of eating seafood must be based on the best available scientific information. The scientific evidence about both benefits and risks, however, is diverse, somewhat incomplete and uncertain. Because of this uncertainty, the committee determined that no easy equation adequately expresses the complexity of the benefit and risk trade-offs involved in making seafood choices. The committee developed a step-by-step decision framework, building upon previous scientific work, to balance benefits and risks.

Based on its recommendations and benefit-risk decision framework, the committee identified four population groups for which evidence supports conclusions about their benefits or risks from eating seafood (shown in Box 1).

Steps need to be taken to minimize the risk of illness from eating seafood, including following general food safety guidelines, e.g., proper cooking.

BOX 1. Appropriate Guidance for Population Groups

1. Females who are or may become pregnant or who are breast-feeding:

- May benefit from consuming seafood, especially those with relatively higher concentrations of EPA and DHA;
- Can reasonably consume two 3-ounce (cooked) servings but can safely consume 12 ounces per week;
- Can consume up to 6 ounces of white (albacore) tuna per week;
- Should avoid large predatory fish such as shark, swordfish, tilefish, or king mackerel;

2. Children up to 12 years of age:

- May benefit from consuming seafood, especially those with relatively higher concentrations of EPA and DHA;
- Can reasonably consume two 3-ounce (cooked) or age-appropriate servings but can safely consume 12 ounces per week;
- Can consume up to 6 ounces of white (albacore) tuna per week;
- Should avoid large predatory fish such as shark, swordfish, tilefish, or king mackerel;

3. Healthy adolescent and adult males and females (who will not become pregnant):

- May reduce their risk for future cardiovascular disease by consuming seafood regularly (as suggested by the Dietary Guidelines for Americans);
- Who consume more than two servings a week should ensure that they select a variety of seafood to reduce the risk for exposure to contaminants from a single source;

4. Adult males and females who are at risk of coronary heart disease:

- May reduce their risk for cardiovascular disease by consuming seafood regularly;
- May additionally benefit from including high EPA/DHA seafood selections (although supporting evidence is limited);
- Who consume more than two servings a week should ensure that they select a variety of seafood to reduce the risk for exposure to contaminants from a single source.

Different population groups need specific guidance for choosing seafood.

Consumer guidance should be coordinated, combining benefit and risk information, and be easier to access and easier to understand.

The conclusions and recommendations in Box 1 were used to create a decision pathway (Figure 1) that illustrates the committee’s guidance from its analysis of the balance of benefits and risks from eating seafood. This information differs from the dietary guidance and advisories from federal agencies and private organizations in three important ways.

First, the information combines benefit and risk information to create coordinated statements. Second, the information covers everyone in the population to remove uncertainties about whether it applies to any specific group. Third, while previous guidance included specific messages for people with a risk for coronary heart disease (and to those with a history of such disease), the committee concludes that current scientific evidence is not strong enough to support providing different guidance messages for them. The conclusions and recommendations for Groups 3 and 4 are similar, and therefore were combined.

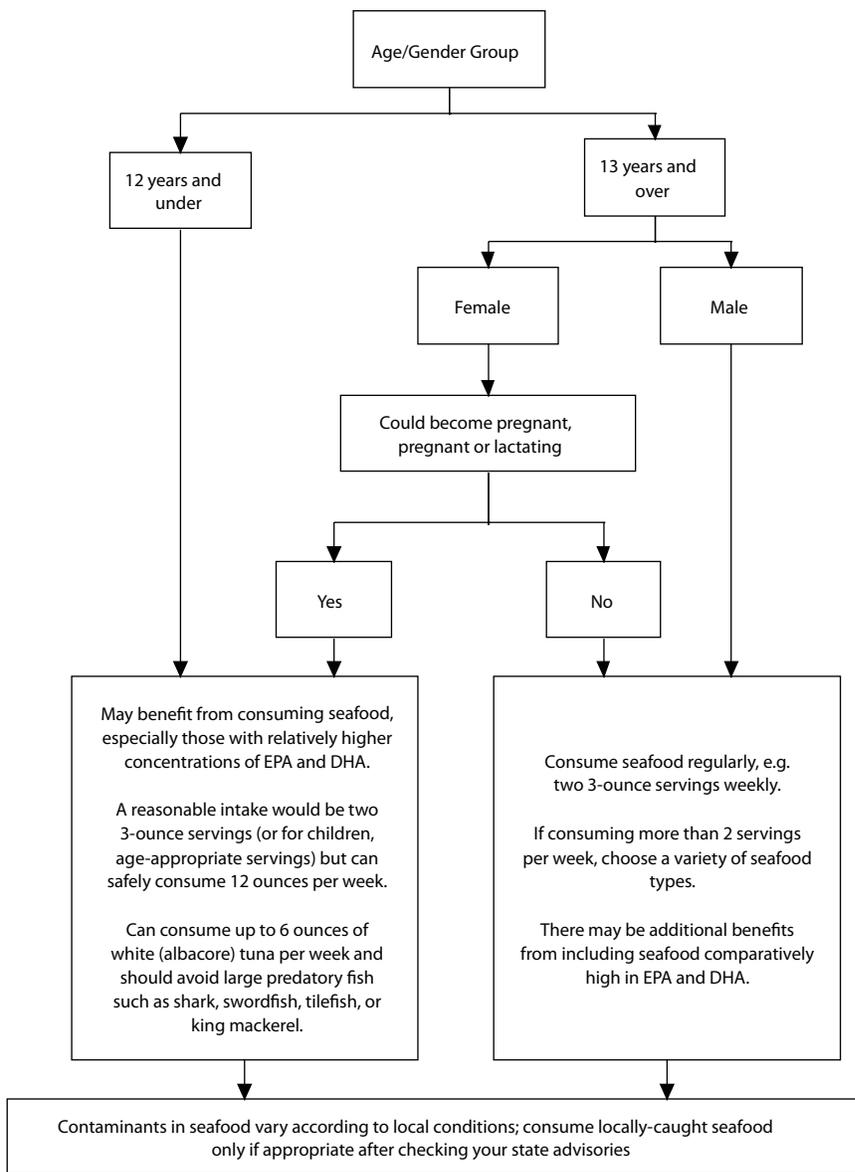
UNDERSTANDING HOW CONSUMERS MAKE CHOICES

Consumer food choice is influenced by a complex information environment and new information, such as dietary guidance, does not necessarily make consumers change the way they eat. Seafood choices, like all consumption choices, entail value tradeoffs; some consumers will make high-risk choices to gain what they value as high benefits, while others will “play it safe”. These differences make the task of informing consumers and supporting their decisions challenging. Consumer guidance should include easy access to information that is presented in a clear and understandable format, supports decision-making, and gives access to additional information when consumers want it.

SUPPORTING CONSUMER SEAFOOD CHOICES

Given consumer differences, effective guidance must take into account that “one size does not fit all” and that messages about making choices need to be tailored according to consumer needs. Developing effective tools to share the most up-to-date information to the public requires formal checking and monitoring of their design and usefulness. Tailoring messages and continuing involvement with community-level organizations will help improve the effectiveness of federal guidance on making seafood choices.

“One size does not fit all” when it comes to messages about making choices. Messages need to be tailored to consumer needs.



The decision pathway puts consumers into specific target groups which face different benefits and risks, and receive appropriate advice.

FIGURE 1. A decision pathway or representation of the balance between benefits and risks associated with seafood consumption. The diagram highlights the factors that put consumers into specific target groups which face different benefits and risks and should receive appropriately tailored advice.

NOTE: The wording in this figure has not been tested among consumers. Designers will need to test the effects of presenting information on seafood choices in alternative formats.

RECOMMENDATIONS

The committee offers the following recommendations about the benefits and risks of seafood consumption, and how consumers should balance seafood choices.

Federal agencies should advise the public about the benefits of seafood. They should also increase monitoring of contaminants in seafood, and make the results widely available to the public.

Federal agencies should develop easy-to-use tools for consumers to help make choices. A decision path needs to be properly tested.

1. Federal agencies should advise the public that seafood is part of a healthy diet, since it can substitute for other protein sources higher in saturated fat and often improve the overall nutrient content of the diet.
2. Federal agencies should encourage pregnant women or those who may become pregnant, to include seafood in their diets. However, any consumption advice should stay within federal advisories for specific seafood types and state advisories for locally-caught fish.
3. Federal agencies should increase monitoring of methylmercury and persistent organic pollutants in seafood, and make the results readily available to the public. These agencies should also develop better recommendations about levels of pollutants that may pose a risk to specific groups of people.
4. Changes in seafood supply sources and types of seafood must be accounted for in the methodology used for sampling and analyzing nutrients and contaminants. Analytical data is not consistently revised with separate data values for wild-caught, domestic, and imported products.
5. Appropriate federal agencies should develop easy-to-use, understandable tools for consumers. These include tools that are computer-based, interactive, supportive of decision making and visual models of risks and benefits. An example of this is the health risk appraisal (HRA) that allows consumers to enter their own information, providing appropriate recommendations to guide their health actions. The model developed in this report provides this kind of evidence-based recommendation for eating seafood. Agencies should also develop alternative tools for people with limited access to computers.
6. New tools apart from traditional safety assessments should be developed, such as consumer-based risk-benefit analyses. A better way is needed to characterize the risks combined with benefit analysis.
7. A consumer-directed decision path needs to be properly designed, tested and evaluated. The resulting product must be continually reviewed and updated. Responsible agencies will need to work with specialists in risk communication and evaluation, and tailor advice to specific groups as appropriate.
8. Consolidated advice is needed that brings together different benefit and risk

considerations and is tailored to individual circumstances, to better inform consumer choices. Federal guidance should be better coordinated with guidance provided through state and local partnerships.

9. Consumer messages should be tested to see if there are spillover effects for those not targeted by the messages. Evidence suggests that risk-avoidance advice for susceptible groups may be unnecessarily followed by other individuals, or the general public.

10. The decision pathway the committee recommends illustrates analysis of the current balance between the benefits and risks of seafood consumption. This pathway should be used in developing consumer guidance tools for selecting seafood to obtain nutritional benefits balanced against exposure risks. Real-time, interactive decision tools, easily available to the public, could increase informed actions for a significant portion of the population, and help to inform important intermediaries, such as physicians.

11. The sponsor should work together with federal and state agencies concerned with public health to develop an interagency task force to coordinate data and communications on seafood consumption benefits, risks, and related issues, such as fish stocks and seafood sources. This task force should also begin development of a communication program to help consumers make informed seafood consumption decisions. Empirical evaluation of consumers' needs and effectiveness of communications should be an integral part of the program.

12. Federal agencies and community organizations should form partnerships that include targeting and involvement of intermediaries, such as physicians, and use of interactive internet communications, which could potentially increase the usefulness and accuracy of communication on seafood consumption.

CONCLUSION

For most people, following accepted dietary guidelines when making seafood choices will balance benefits and risks. For specific groups of people, including women who are or may become pregnant, infants, and those who are at risk for cardiovascular disease, making balanced seafood choices requires that consumers consider both nutrients and contaminants that may be present in seafood and that they receive useful information on both benefits and risks simultaneously to inform their choices. The committee has given its interpretation of the evidence for benefits and risks associated with seafood consumption and considered the balance between them. It has also identified research opportunities that will contribute to filling knowledge gaps. Its recommendations are intended to aid in developing appropriate consumer guidance for making seafood choices.

The decision pathway should be used in developing consumer guidance tools for selecting seafood.

An interagency task force should be developed to coordinate data and communications on seafood consumption.

FOR MORE INFORMATION...

Copies of *Seafood Choices: Balancing Benefits and Risks* are available from the National Academies Press, 500 Fifth Street, N.W., Lockbox 285, Washington, DC 20055; (800) 624-6242 or (202) 334-3313 (in the Washington metropolitan area); Internet, <http://www.nap.edu>. The full text of this report is available at <http://www.nap.edu>.

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