

Goherr recommendations

DO NOT EDIT THIS VERSION! THE
UPDATED VERSION IS AT

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Final recommendations

2. **Suggestions for designing, implementing and evaluating the efficacy of relevant public policies and governance, originating from the project[PEH1] [PEH2] TEXT DIRECTLY FROM THE FINAL REPORT.**

- #1 BONUS GOHERR recommends prioritizing measures to reduce dioxin emissions and consequently concentrations in the aquatic environment over measures trying to manipulate dioxin concentration in fish via altered fisheries practices. GOHERR results show that altered fishing intensity and size-selectivity is unlikely to substantially reduce dioxin concentrations in both herring and salmon,

and that it has a smaller effect on dioxin concentrations in fish than do lowered dioxin concentrations in invertebrate organisms, the prey for herring.

- #2 Despite this, GOHERR recommends involving the fisheries sector in governing the dioxin problem of Baltic herring and salmon fisheries, in collaboration with the environmental and the public health sectors. Dioxins and the related selling restrictions have negative effects on the livelihood of fishermen, the coastal culture, and regional, EU-level, and even global food security. Thus the fisheries sector, as a stakeholder, could contribute to a multi-sector governance framework to enhance the capacity of society to deal with the dioxin problem. This could lead to identifying a wider variety of ways to manage the problem, as suggested in Pihlajamäki et al. 2018 (Food security and safety in fisheries governance. A case study on Baltic herring. Marine Policy. <https://doi.org/10.1016/j.marpol.2018.06.003>).
- #3 In the above-mentioned GOHERR publication, Pihlajamäki et al. suggest increasing the contribution of EU fisheries to the universal food security objective by 1) including explicit objectives for increasing human use of catch in the EU Common Fisheries Policy and the related multiannual plans, 2) broadening the scope of the Maximum Sustainable Yield -driven governance and management to one that also addresses catch use, and 3) implementing proactive catch use governance and management.
- #4 GOHERR results suggest that health benefits of Baltic herring and salmon outweigh risks in age groups over 45 years and in young males. For this reason, consumption of small herring (<17 cm) and young salmon (40-80 cm) should not be restricted in these groups. In women at fertile age the critical issue is the potential negative impacts of dioxins in their children, not on the women themselves. However, there are still large uncertainties in the scientific basis of this advice. Thus, GOHERR recommends targeting information and eating recommendations to the right consumer groups. Consumption of freshwater fish includes no dioxin risk.
- #5 GOHERR also recommends increasing the legitimacy of fisheries management decisions by explicit inclusion of socio-cultural values associated with fish and fisheries (e.g. social justice, traditions, environmental values, symbolic values) in the early stages of policy processes, i.e. problem framing and scientific appraisal. This would entail incorporating the requirement to address values also in the key policy documents and strategies. Acknowledging and deliberating the different ways fish and fisheries matter for society would promote social sustainability and morally reasoned use and management of fish resources.

Rationale for the recommendations and related discussion

Reduce dioxin emissions rather than manipulate fish stocks

Premises:

- #6 Dioxin is a health hazard and thus its concentrations in fish has to be considered.
- #7 Dioxin comes to the environment mostly from industrial and burning processes, which can be managed.
- #8 Airborne dioxin deposits on the ground and water ecosystems and accumulates especially in marine food chains. This results in high concentrations in predatory fatty fish such as salmon and herring.
- #9 Salmon get dioxins from herring in the predator-prey interaction
- #10 Growth / size of fish is a definitive factor for bioaccumulation of dioxins
- #11 Thus it can be hypothesised that by manipulating the growth of herring, dioxin concentrations in both species could be reduced.

Goherr results:

- #12 Dioxins in fish cannot be effectively reduced by manipulating fish stocks.

Involve fisheries sector in management of dioxin problem

Premises:

- #13 Fisheries sector is affected by dioxin policies, because they restrict marketing and consumption of especially Baltic herring. They also restrict developing “high value” markets for Baltic salmon.
- #14 The dioxin problem is currently only governed by restricting emissions and by restricting the selling of fish that contain dioxins.
- #15 The fisheries sector, although a major stakeholder, is not involved in governing the dioxin problem of the fisheries
- #16 The selling restrictions, exemptions from them, and the related eating recommendations differ in different countries, which confuses consumers of whether or not Baltic fish is safe to eat, and weakens the image of the fish (and potentially the whole Baltic Sea)

Goherr results:

- #17 Involving fisheries sector in governing the dioxin problem could lead to identifying new management strategies (and harmonizing them between countries).

Increase EU fisheries contribution to food security

Premises:

- EU Common Fisheries Policy (CFP) aims to increase the contribution of fisheries to food security.
- CFP identifies aquaculture as the main strategy to increase the contribution of seafood to food security and to reduce food import from non-EU countries.
- CFP ignores the contribution potential of small pelagic fish, such as Baltic herring, which are abundant.
- Baltic herring stocks are mostly in good condition. Expected yields are fairly large.
- The majority of Baltic herring catches are used as feed in fur and fish farming.
- Using small pelagic fish for human consumption rather than for industrial purposes is recommended by FAO

Goherr results:

- #19 There is a shared interest among fisheries stakeholders to use Baltic herring primarily as food.

- Several pathways including actor specific actions to increase the use of Baltic herring as safe-to-eat food by 2040 were created in the first international BONUS GOHERR workshop.

Include socio-cultural values explicitly in fisheries governance

Premises:

- The way fisheries are managed (implicitly) reflects the human values associated with fish and fisheries.
- #20 Fisheries management (as other sectors of management) should not be in conflict with important societal values.
- There is a need to develop theoretical approaches to the analysis of socio-cultural values related to fisheries.

Goherr results:

- #21 There are a lot of important societal and cultural values that relate to Baltic herring and salmon. Similarities and differences in these values between Baltic Sea countries and stakeholder groups were identified and analysed by in-depth interviews.
- #22 Many important values are currently underrepresented in fisheries governance. The situation threatens the existence of some parts of cultural practice and the legitimacy and effectiveness of management.
- Deliberative approach and theoretical framework to the analysis of values related to fish and fisheries were introduced and evaluated.

Size-specific promotion of Baltic herring consumption

Premises:

- #23 Dioxins accumulate in individual fish when it gets older and start eating prey on higher trophic levels. Therefore, larger fish tends to have more dioxin than a smaller one of the same species.
 - #59 NB! This is valid only within the same area. The concentrations of a smaller fish from northern parts may be higher than a bit larger from the south. Well, anyhow it does not change the recommendation. / Annukka
- #24 Baltic herring and salmon are species that have relative high dioxin concentrations compared with other Baltic species.

Goherr results:

- #25 With the current dioxin concentrations and fish consumption patterns, people in Baltic Sea countries (DK, EST, FI, SWE) may exceed the EFSA tolerable weekly intake (TWI). 5-25 % exceed the current recommendation 14 pg/kg/week in different subpopulations. In contrast, if the new suggested TWI of 2 pg/kg/week is used, 30-70 % exceed the limit in different subgroups. This is most of the people that eat salmon and herring at all.
- #26 However, despite these exceedances, there are net health benefits from eating these fish species in all subpopulations, except in young fertile women where the case is more complex. See argument #X.

Possible policy recommendations about promotion of a particular size fraction of Baltic herring.

The promotion takes primarily place in food industry but also as consumer recommendation.

(Exclusive and mutually exhaustive options [assuming that 17 cm is the proper cut point], i.e. one of the three logical alternatives must be chosen):

- #27 Don't promote the use of any specific size fraction of Baltic herring.
 - #29 DEFEND.
- #28 Promote human consumption of small-bodied (<17 cm) Baltic herring, due to its positive net health effects and lower dioxin concentration than those of large herring.
 - #29 ATTACK. I can't see how we can have this general recommendation.
 - First, our results show that the size-limit is not a fixed thing - smaller herring can contain higher dioxin content than those used once upon a time for setting the 17cm limit, depending on the growth pattern.
 - And, as Annukka pointed out, the dioxin content (and therefore important limits) vary by area. That's why they did their spatial study, I guess.
 - Finally, I don't see from the GOHERR studies why we should promote eating BALTIC fish - from a health perspective, the benefit is in the omega3 and not unique to fish from the Baltic. Food security argument has never been part of the project. / Anna
 - #55 Small herring promotion can be done in two different ways: making recommendations to the public, or by targeting food industry and facilitating production and marketing of products made of small herring. We should prioritize the latter to avoid confusing customers.
 - #56 New products made of "healthy herring" would create new markets, maybe even to other parts of Europe. The larger herring could be used for feed. In the feed industry the dioxins can be removed.
 - #52 Food security argument encourages us to eat Baltic herring, so you have to balance between two harms anyway. Promoting small herring minimizes health risks while increasing food security. We didn't quantify the value of food security so this is done only qualitatively. / Jouni
 - #57 Promoting small fish has other reasons, too. Different foods can be made from small fish, and that potential is largely unused (except maybe in Estonia). / Jouni
 - #58. The policy analysis model of GOHERR (WP6) demonstrated that all the consumer groups benefit from eating smaller herring (also salmon) as the dioxin concentrations are lower in smaller fish.
 - #69 There is no zero-risk situation, but why wouldn't we still aim for minimizing the harm, while maximizing the utilities? This can be done by promoting the use of smaller fish.
- #30 Promote human consumption of large(>17 cm) Baltic herring.
 - #31 This has not been suggested because it would worsen dioxin exposure, but it is here as a logical alternative.

Restrictions about Baltic herring in non-sensitive subgroups

Premises:

- #24 Baltic herring contains dioxins.
- #26 There are net health benefits in eating Baltic herring.

This recommendation applies to all other subgroups except children and young women that plan to get pregnant and have children. This recommendation comes in addition to whatever has been decided about size-specific promotion of Baltic herring. Possible options:

- #33 Baltic herring should be eaten at most 3-4 times per year.
 - #34 The new suggested EFSA tolerable weekly intake of 2 pg/kg/week is exceeded with larger consumption.

- #35 Baltic herring should be eaten at most 1-2 times per month.
 - #36 This is close to the current recommendations for fertile women.
- #37 Baltic herring should be eaten according to the current recommendations, which vary from country to country.
 - #38 Variation reflects different valuations in different countries.
 - #39 Goherr results do not bring any dramatic change to our understanding, so we should keep on the status quo.
- #40 Baltic herring can be eaten freely.
 - #41 If you want to have a recommendation on removing the ban for men > 45yr where you saw the health benefits, and for women older than fertile age, that's fine with me. / Anna

Restrictions about Baltic herring in the sensitive subgroup

Premises:

- #24 Baltic herring contains dioxins.
- #26 There are net health benefits in eating Baltic herring.
- #79 Dioxin has negative health impacts on developing fetus and newborn, the most sensitive individual.

Goherr results:

- #46 BONUS GOHERR health benefit-risk assessment (WP5) showed that Baltic fish improves public health and even in the target group (fertile women planning to have children), the benefits and risks are close to each other.
- #47 BONUS GOHERR survey (WP5) showed that recommendations to limit Baltic herring and salmon use are ineffective on average and even counterproductive with many people.

This recommendation applies only to the sensitive subpopulation, i.e. children and young women that plan to get pregnant and have children. This recommendation comes in addition to whatever has been decided about size-specific promotion of Baltic herring. Possible options:

- #42 Sensitive group should eat large (>17 cm) Baltic herring at most 3-4 times per year.
 - #43 This is implied by the suggested EFSA TWI from August 2018.
- #44 Sensitive group should eat large Baltic herring at most 1-2 times per month.
 - #45 This is close to the current recommendations.
 - #46 ATTACK Health risks and benefits are close to each other in the sensitive subgroup.
 - #80 COMMENT. Note that the risks go to the child, while some of the benefits go to the mother. This may be relevant when individual net health benefits are considered.
 - #47 ATTACK Restrictive recommendations are ineffective.
- #48 Stop health-based dioxin restrictions.
 - #49 ATTACK. Dioxin is a health concern, so we cannot just stop restrictions.
 - #50 I cannot support this very general recommendation as you in your analyses do find health risks to children and fetuses, incl serious ones like IQ. The health benefits comes not from Baltic fish, but from any source of omega3, so there is no need to promote eating dioxin-containing fish if there is any risk at all to humans. /Anna
 - #51 ATTACK. All fish contains some dioxin and some methyl mercury, so the zero-risk approach does not hold. It is true that those

risks are smaller with some other fish species so it is possible to prefer those.

- #52 I think this statement is too controversial for SLU. /Andreas
- #53 I think the thing to keep is that we should promote is better use of small-bodied fish for human consumption, and incorporate that in the first suggested recommendation above (i.e. to keep current recommendations) / Magnus
- #arg7993.1 Dioxins have some well known harmful health effects (the tooth developmental thing) and in addition some potential, not so well known or defined. In addition there still are fish in the Baltic Sea that exceed the safe limits. For this reason I wouldn't like to say that "Hey, you can safely eat as much as you want, go ahead!" / Annukka
- #arg7998.2 The results of the integrated model showed that promoting fish eating is beneficial to elderly people, but produced harm to the young female. This result is based on the change in DALYs as the measure of utility / harm. Thus although promoting fish eating would be slightly beneficial on population level, we should not give the recommendation 1. To my mind each young female should have the right to know the existing risk, even though it is "only" something related to the teeth of their children. And wasn't one of the fish eating query results that people would like to get more transparent information? / Annukka Lehtikoinen
- #54 If we believe that dioxin risk is below concern, why would we need extra measures? This would give conflicting messages and deteriorate the main message that people can stop worrying about dioxin in their food.
- #60 Dioxin risk has decreased to level below concern. Give up the restrictions to sell Baltic herring and salmon in EU, because they are ineffective in protecting public health. Instead, they deteriorate the viability, sustainability, and brand of Baltic fishing. / Jouni
- **#61 ATTACK. This recommendation is unacceptable.**
 - #62 I don't think this recommendation follows from GOHERR's results. I think it is a better solution that THL recommends this. /Andreas
 - #63 I cannot support this statement at all. Could something closer to what was in WP5 in the third periodic report be a workable compromise (where you point out for which groups the ban could go away without any harm)? / Anna
 - #64 I agree with andreas suggestion that it is better that thl themselves go forward with this recommendation if they want but that we do not include it here (i.e. we cannot do that as we do not agree on this specific suggestion) / Magnus
- #67. We must remember that it is not only about individual choices. Rather, the large retail companies make significant decisions on behalf of consumers. For example, if Prisma in Finland decides to remove a product from their selection, one million Finns will stop using that product. Therefore, the health-based recommendations should be clear and also guide decisions of retail companies.
- #68 We can recommend this because there is no zero-risk situation. If people eat less fish, some people will actually die. So, I guess we agree that in general, we should recommend more fish consumption, even Baltic species that contain some pollutants.

- #70 For more than 20 years in Finland, there has been discussion about dangerous dioxins in Baltic herring. At the same time, the Baltic herring consumption has decreased by 90 %. Of course this is not only due to the dioxin warnings, but it has probably had a significant role. So, we have lost a lot of people due to cardiovascular diseases that could have been avoided by more fish eating. We have gone too far with our restrictive recommendations. / Jouni
 - #71 ATTACK. You say “dioxin warnings, but it has probably had a significant role” - do we have any results in any GOHERR analyses that shows that this is the case? If not, we cannot recommend abandoning dioxin ban, because we do not know how this will affect consumption. / Anna
 - #72 ATTACK We don't have data about historical impacts of recommendations. But we do have data about what people say they would do if recommendations are changed. And that is one part of the model and thus recommendations. /Jouni
- #73 The tooth and IQ problems in children are mild, so we are not putting any identifiable people in great risk. This is in compliance with the "first, do no harm" principle by Hippocrates. Also, the total disease burden in children is not large and it is not that different from the benefits to their families, so there is a fairly good balance also on the subpopulation level. /Jouni
 - #74 One additional premise that is not in the model is that if we hope that adults eat fish in the future, they need to learn that when they are children. Therefore, we should not scare young families with horrors of fish eating, because although the risks are not zero, they are not large. / Jouni
- #75 Recommendation related to fertile women (or even more specifically: fertile women that are planning to have children at some point) is fine. But due to the reasons described above, I think that that is only the second-best recommendation we can make. The best recommendation is that we could just stop worrying about the minor dioxin risk and focus on promoting the consumption of fish, which is healthy for public health, and in the case of Baltic herring also sustainable (unlike many ocean species). Dioxins were the problem of 1980's, but now they are largely in control. In 2010's, we should focus on sustainability, climate change, and food security. Those are the real threats today and the near future. / Jouni
 - #76 This is a good point about what we should focus on. / Päivi

Recommendation about dioxin management

Premises:

- #87 Dioxin is a man-made pollutant produced unintentionally in many incineration and industrial processes. Emissions are typically to air, from where they deposit to soil and water ecosystems.
- #88 Dioxin accumulates in the food chain, especially in aquatic systems where there are several trophic levels.

Goherr results:

- #78 BONUS GOHERR (WP4) showed that manipulating fish stock sizes and catching strategies is ineffective / SLU
- #86 The integrated policy analysis of BONUS GOHERR (WP6, integrating the outputs from the other WPs) showed that reducing the dioxin load is the only effective way to (further)

decrease the concentrations in herring and salmon (in comparison with fisheries and nutrient load management). / UOUL

Possible management strategies (several strategies may be applied together)

- #77 Manage the dioxin problem at the fisheries level.
 - #78 ATTACK Fish stock manipulations are ineffective.
 - #80 ATTACK Ecological sustainability should be the first criteria for fisheries management. This is important both from the perspective of ecosystem's stability and the societal food security.
 - #81 This is a good point and should be used as a justification. / Päivi.
- #89 Manage the dioxin problem by reducing dioxin emissions.
 - #82 I don't see why we need this splitting up. I've rephrased a recommendation on which to prioritize based on our modelling results, at the beginning of this document. / Anna
 - #83 ATTACK. I split it up due to reasons relating to the argumentation process. Some recommendations have several parts and we may agree on one but not another part. The whole hierarchy exercise is for being specific about what we talk about. When a resolution is found, we can rephrase the text as needed. / Jouni
 - #84 Many dioxin sources are still point sources and can be effectively managed. This approach reduces problems everywhere, not only in Baltic fish. / Jouni
 - #85 Dioxins come mostly from burning processes, waste incineration, and metal smelting. Cleaning these processes also helps tackling greenhouse gas and other emissions, not only dioxins. / Jouni
- #90 Manage the dioxin problem at the food and feed sector. Implement monitoring programs and concentration limits in food and feed.
 - #91 If restrictions based on dioxin concentrations are in place (e.g. restrictive recommendations on fish consumption), monitoring of those products is needed.
 - #92 It is the current practice in the EU to monitor dioxin concentrations in food and feed. This should be continued.

Impact of uncertainties on health recommendations

Premises:

- Uncertainties about how things are typically complicate decision making, as the impacts of a particular action are not known with certainty.

Goherr results:

- The value of information analysis on health risk-benefit assessment (WP5) showed that the remaining scientific uncertainties are often large. However, the value of reducing that uncertainty is fairly low (ca 100 DALY/year or less), because it is unlikely that conclusions would change because of these uncertainties.

Possible recommendations:

- Emphasise large uncertainties in the scientific basis of advice.
 - #65 Could this be formulated so that the recommendation includes: 1) the results of THL, 2) reference to food security which these results support BUT ALSO, 3) transparency of the limitations / uncertainty of the risk-benefit assessment. Surely there is uncertainty in the assessment, which is a basis for the recommendation? / Päivi

- #66 ATTACK. There is no need to talk about uncertainties, because the conclusion is driven by value judgements, not uncertainties. In other words, the remaining uncertainties (which some are large) do not actually change our conclusion, i.e. the value of reducing these uncertainties is low. However, a value question is critical: do we want to maximise net health benefit, or do we want to avoid risks of dioxins, even if it is not the best solution for total health. / Jouni
- Acknowledge uncertainties but make clear that the recommendations are robust, given the valuations used (such as emphasising net health benefit over exceedances of tolerable weekly intakes).
 - The differences in valuations actually have a large impact on conclusions, as demonstrated by this discussion among Goherr experts. The arguments were mostly about what aspects should be emphasised (e.g. avoid even small risks if you can) rather than disagreements (i.e., uncertainties) about the risk estimates themselves. / Jouni

Discussion about how recommendations should be derived

Possible strategies to derive a recommendation (partly exclusive, i.e. some combinations are impossible):

- #93 Goherr recommendations should be based on consensus among the whole project.
- #94 Goherr recommendations should be based on majority vote.
 - ----arg1642: . To try if we can end up to a democratic decision: Jouni, will you do a doodle poll? Perhaps include the two alternatives you suggested, and the third that there already is (> 45 years) ?? And whatever the final recommendation will be, would it good to include some background information in the recommendation text i.e. what the recommendation is based on? (value judgment based on...(food security?)....and a sentence about the risks vs benefits assessment?) Päivi Haapasaari
 - <---arg2220: ATTACK. I'm sorry but this is not a majority vote. We need consensus. Else you can't have it in the report. Anna Gårdmark
 - <---arg8358: ATTACK. I agree. We need consensus. But in my experience, consensus is based on discussion and compromise. So far we seem to have had the discussions, but not much compromise. Without compromise, I don't see how we can come to a consensus and we may need to follow Paivi's suggestion of a vote? This is an issue that is so central to the project, I don't see how we can NOT have a recommendation for it in our final report. So simply leaving it out due to lack of agreement doesn't seem like a tenable solution. Alyne Delaney
- #95 Goherr recommendations should be based on first excluding everything that is not in line with the project premises (which need to be explicated) and Goherr results. What remains is then a basis for discussions about recommendations.
- #96 Individual institutes may give separate recommendations if other Goherr institutes disagree about conclusions.
 - #97 ATTACK. These are Goherr recommendations and I don't like the idea of having disclaimers. If it gets rejected, we leave it out. However, I haven't seen any specific arguments against it. Do you disagree with some of the premises, or the reasoning? I argue here that this recommendation DOES arise from Goherr/wp5

results, backed up by the explicit values of improving public health and food security. With "any specific argument" I meant any specific, undisputed argument. We seem to all agree that eating small herring should be promoted. But that is not an argument against getting rid of ban on large herring. The argument that we could eat other fish rather than large herring has a premise that the difference between a very small risk and zero risk is very important. I think that difference is very small and thus not important. / Jouni

- #98 Goherr recommendations should be based on scientific results only, and not include value judgements.
 - #99 ATTACK It is not possible to recommend something without some underlying value judgements. But several of those have been explicated already in the Goherr Description of Work: maximizing net health benefit, acknowledging cultural values of fishing, increasing sustainability in the Baltic Sea. So, Goherr recommendations should be based on those values.
 - ----arg7993: . I tend to think so that our responsibility as researchers is to report our findings honestly and objectively, not to support any political agendas. Value judgements are always related to decision making, but that is something the decision makers should do - not us! We can help the DMs to make these judgements, that's all. / Annukka
 - #arg7993.3 We know the policy makers would like to get simplistic recommendations and one number -type of answers. Anyhow, as the things really are not that simple in reality, we need to make them realize that and provide as simple recommendations of the complex system as we can - but not any simpler (Occam's razor principle). / Annukka
 - ----arg3935: . I have to make the PDFs and submit before 3 pm today. So there is not much time anymore for this. My suggestion is: Why couldn't we do as Annukka suggests? Give the results and let decision makers draw conclusions? / Päivi Haapasaari

Update based on EFSA committee work

Discussion about benefit-risk assessment update

Interesting to see your new results, Jouni. However, as Päivi and Annukka said, I think it is important to base the recommendations from the project on things that we actually produced during the project, and not extra stuff. So i would leave this part out of the recommendations. / Anna

- I did not intend to have this as a part of the recommendations. However, it is an important and influential piece of expert opinion and if my suggested recommendation stands, we must show that we did consider what EFSA has said. Otherwise we would be outdated already at the day of publication. / Jouni

Why did we not talk about this during any of our meetings? A bit late now to include various limits we have not discussed all together in my opinion /Philip

- This was not discussed, because EFSA published their suggestion to lower the TWI on 29th Aug 2018, so just a few days ago. The old TWI was a part of our benefit-risk assessment and those results have been around for several months. / Jouni

Implications of EFSA committee work

EFSA committee has today (29.8.2018) released a new assessment of the tolerable weekly intake (TWI) of dioxin. The committee suggests that the TWI is reduced from the current 14 pg/kg/week to 2 pg/kg/week, so a sevenfold decrease. The reason for a new tighter recommendation is that there is new information about a sensitive endpoint: sperm concentrations in men that were exposed before the age of 9 years. The data comes from two sources: Seveso accident (Mocarelli 2008, 2011 at EHP) and Russian children's stiludy (Minguez-Alarcon, EHP 2017).. Sperm concentrations go down by up to 40 % when the dioxin concentration in boy's serum fat exceeds 10 pg/g and stay at lower level permanently. This was used as the main criteria to update TWI.

I reran the Goherr model with these new outcomes. The exceedance of the new TWI is called TDI2018, and the sperm concentration was converted into infertility based on knowledge about how much more difficult it will be to get a child when the sperm concentration goes down to certain levels. The results are in this figure.

Fig 22. Burden of disease by country, group and policy

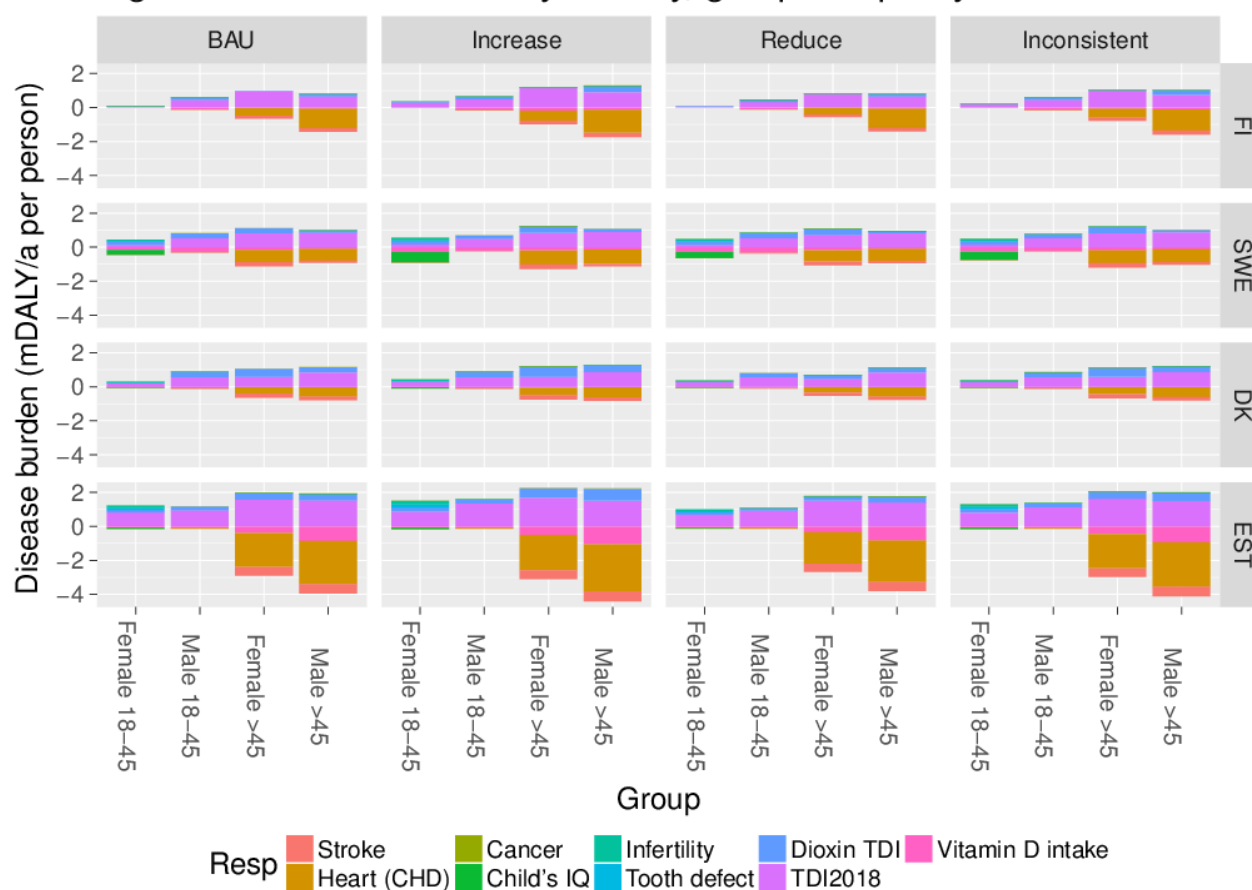


Figure 1. Burden of disease in subpopulations and after different policy options. Infertility and TDI2018 (tolerable weekly intake of dioxin based on the August 2018 recommendation by an EFSA expert group) are endpoints that were not considered in the Goherr benefit-risk assessment in April 2018.

What does this mean? First, the purple 2018 is fairly large in all groups, but not as large as the cardiovascular benefit. It should be noted, that the TWI is only relevant for young women (who

expose their sons during pregnancy and breast feeding), because other groups cannot get the health outcome that was the criteria for TWI.

Second, having both infertility and TDI2018 on the same figure is double counting, and infertility is the more relevant outcome. Actually showing also the previous TWI (called Dioxin TDI on graph) is triple counting.

Third, infertility as a new outcome does turn the balance towards higher risks and makes us rethink our recommendations. However, I am actually surprised how little it affected the disease burden, considering that the TWI change from 14 to 2 pg/kg/d sounds really dramatic. When I first heard of this new EFSA recommendation, I thought that it may change our GOHERR recommendation, but looking at the new numbers does not make me change my mind.

What do you think?

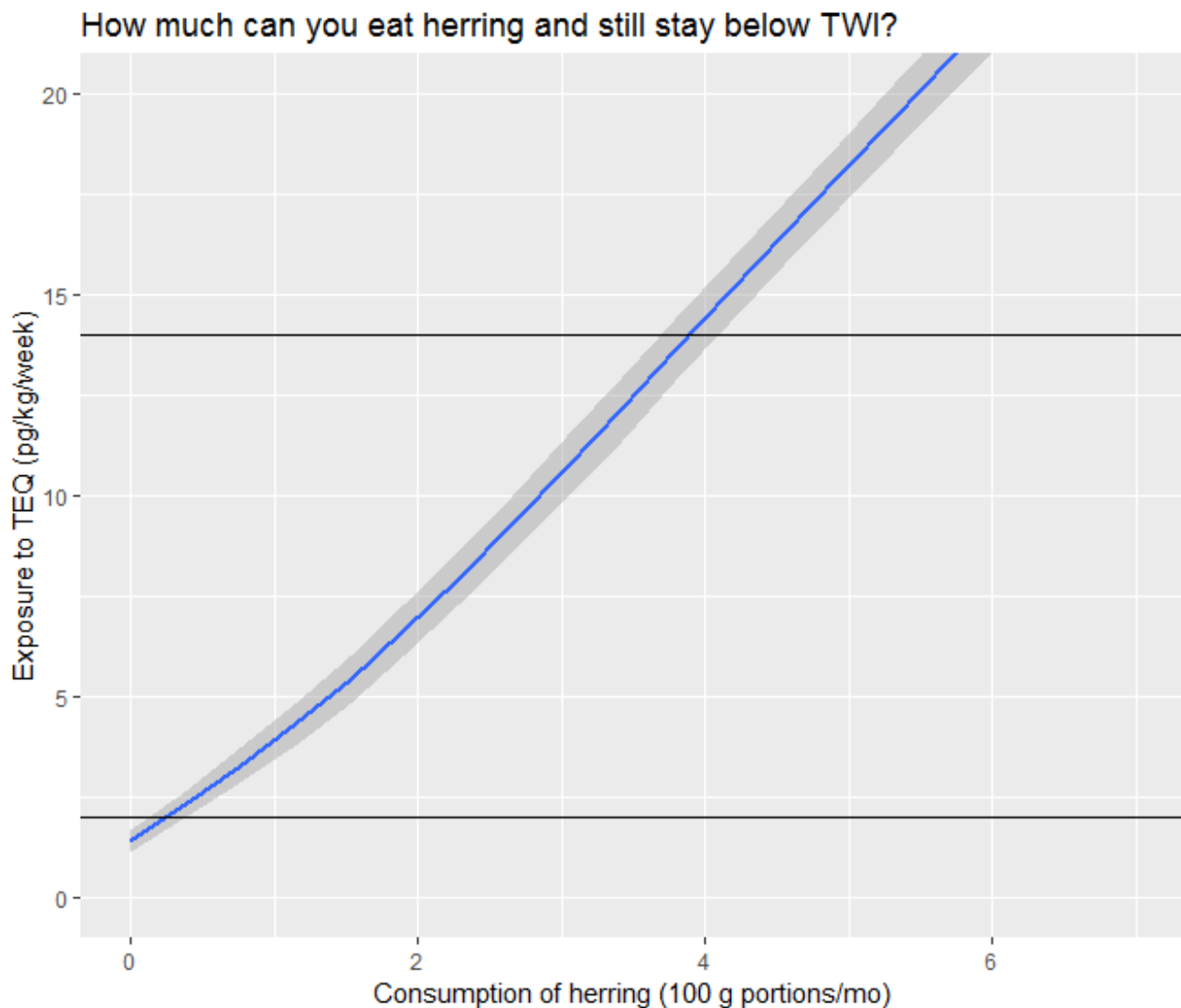


Figure 2. shows how much you can eat herring according to the Goherr model results, if you want to comply EFSA's current (14 pg/kg/week) or new suggested tolerable weekly intake (TWI) (2 pg/kg/week), which is indeed 7 times lower. In practice, the lower tolerable weekly intake means 3-4 times per year at most. But suggesting such restriction would go against our main results based on net health benefit. This is a major change if policies are based on tolerable weekly intakes rather than net health benefit. However, this is currently a suggestion by an EFSA expert group, not an official decision by EFSA.

Further research and exploitation of the results [PEH1]

Please consider also this, and the next question below.

GOHERR analysed socio-cultural values in the context of fisheries governance and management, and suggested a method for that. Further empirical analyses of **existing policies** are needed to understand **which** values currently guide fisheries management, and **how the balance between different values is addressed**. Furthermore, practical tools for structured dialogue and deliberation for achieving legitimate compromises between different values need to be developed.

Wider societal implications (incl. gender equality actions, ethical issues

(if appropriate), and efforts to involve other actors and spread awareness [PEH1]

Sustainability and food security are real threats today and in the near future. Ecological sustainability should be the first criteria for fisheries management. This is important both from the perspective of ecosystem's stability and the societal food security. BONUS GOHERR has provided recommendations (?) on how to increase the contribution of fisheries to food security while ensuring ecological, social and economic sustainability of fishing activities.

The efforts of BONUS GOHERR to involve stakeholders and spread awareness included: two international stakeholder workshops, stakeholder interviews, short film on Baltic herring, numerous conference and seminar presentations, popular news articles, interviews given by the consortium member(s), etc...