

Factors Affecting Salmon Preferences of Alaska Children and Their Parents

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Abstract

This study taste tests three newly developed salmon recipes made from the low-grade Chum salmon and uses data collected from parents and students in Fairbanks, Alaska to understand: 1) factors to change the consumption preference of parents and their children's salmon choice? 2) How different the opinions are from parents than their children in salmon consumption? And 3) how the new recipes are accepted and factors that affect the attitude to improve the recipes. Preliminary statistics and Probit results show that: 1) most students and parents thought the fish items were appealing and they were willing to taste the recipes. 2) According to the appearance and taste of the products, students rated the salmon burger as most preferred, followed by the salmon patty, and the salmon ball. And 3) Parents rated the three products in the same preference order, but their preference seems to be affected by good flavor, texture, and appropriate saltiness. Findings from this study provide insightful information to help school food service directors and parents understand factors to affect students' salmon choice and to improve their salmon consumption.

Keywords: salmon consumption preference, Alaska children, parents and children's salmon preference, seafood consumption choice

1. Introduction

Encouraging children to consume more fish is challenging (Altintzoglou, 2010; Altintzoglou, 2014). Fish is good protein source, good source of beneficial minerals, and good vitamins (Sidhu, 2003; Mozaffarian & Rimm, 2006); however, having children relate these health benefits to themselves is difficult. As a result, the consumption of fish among children has remained low across the states (Birch & Lawley, 2012). Parents have communicated their concerns to seafood processors and school food service programs, hoping to see an increase in their children's fish intake through the school meal programs (Xu et al., 2015). Seafood nutrition advisors collaborated with school food service programs in Norway, where fish consumption is low among children despite high availability, to lead an initiative to have children consume more fish (Altintzoglou, 2010; Altintzoglou, 2014). However, empirical research seems to suggest that eating at school has a negative impact on children's seafood demand (Ross, 1995). Anecdotal evidence also shows that the unfavorable food attitude from school spreads to effect children's seafood behavior at home (Altintzoglou, 2010). Ultimately, the presence of children would decrease the family's fish consumption, due to reduced fish meals prepared. Indeed, parents are less likely to feed their children fish if their children dislike the smell or taste of it (Verbeke & Vackier, 2005). But parents' own food choice can positively change fish consumption of their children: viewing parents expressing pleasant comments about the food they consume motivates children to eat the same food (Barthomeuf et al., 2009). In this study, we examine Alaska parents and their children's opinion about three newly developed salmon recipes to understand factors that could be used to improve children's attitude towards consuming the fish items in their school lunch. We also study opinions to improve the fish recipes to increase children's intake of fish. This study provides insightful information to help school food service programs in Alaska and other states better understand parents' and their children's fish preference and assist school food service directors in proposing fish recipes that are well-liked by students.

Alaska is the nations' largest supplier of wild salmon and this study helps to propose effective food menus both to school food service directors and to parents. Questionnaire data were gathered from Fairbanks, Alaska after having elementary and children and parents taste tested three newly developed salmon recipes. Many children who participated in this study have also participated in the national school lunch program. Thus, lessons learned

from this study can provide important information to help with the understanding about how product-specific attributes about the three recipes as well as how children's- and parents'- specific profile affect their salmon preference. We address the following four research questions: 1) what factors will affect children's salmon choice and what factors affect parents' salmon preference? 2) Are there common factors that would influence parents and children alike? 3) whether opinions from parents are different from children. And 4) which recipes are considered the most favorable and their opinion to further improve the recipes? Answers to these questions are of paramount importance to the understanding about children's fish choice related to specific fish recipes. Answers to these questions can also help with the planning of meaningful strategies to ultimately improve fish consumption among children in Alaska.

The ultimate goal of this research is to increase salmon consumption among elementary- and middle- school students in Alaska, which will contribute to the health of Alaskan youth. USDA health officials have recommended that children should eat fish frequently, with one meal size of 6 ounces, uncooked weight (Fish Consumption Point System, Health & Social Services, State of Alaska). The maximum recommendation of twice per week was set to restrain the consumption of high mercury species. However, the consumption of the low mercury species of the state's most affluent pink, chum, coho, and sockeye salmon was greatly encouraged due to their exceptional health benefits (Loring et al., 2010). Recently, a study reveals that salmon is the most consumed species for the residents of Alaska's Kenai Peninsular and their children has also consumed salmon often (Loring et al., 2012). Statistics show that due to new regulations to reduce traditional harvest areas causing decreased hunting and fishing activities, the consumption of salmon has fell in Alaska. As a result, more households are transitioning away from locally harvested food, especially salmon, to store-bought foods shipped in from elsewhere (Loring & Gerlach, 2009). The low nutritional value of imported food has caused health issues: for instance, the lowered consumption of salmon was found a reason for prostate cancer (Dewailly et al., 2003). Moreover, reduced hunting activities destabilized gender's role in a household, weakened men's overall position within their families and communities, and caused alcoholism and depression (Graves, 2005). To Alaska's children, reduced salmon consumption put risks not only to their physical health but also to their psychological health (Loring & Gerlach, 2009). To improve the health of Alaskan children by increasing their salmon consumption would ultimately contribute to food security among Alaskan local communities. USDA has funded a fisheries-to-schools research program, which emphasizes its research aspects to develop a model which incorporates high quality, culturally important traditional fish into school meals and to strengthen local and regional fish markets (Center for Alaska Native Health Research, 2013). This current study uses data provided by this research project.

2. Literature Review

Even though the linkage between children's fish consumption and their cognitive development is not established, published studies have indicated that children's cognitive ability is affected by their age (ASTM's Committee E18 on Sensory Evaluation; Wadsworth, 1984). According to ASTM's Committee 18, children 5-8 years (early readers) have only moderately developed language skills and their limited decision making is influenced by adult (Table 1, cited from Guinard, 2000, p. 275). Because of children's incomplete verbal skills, phrasing of survey questions should be given special consideration (Guinard, 2000). This is particularly important when survey children for questions regarding sensory attributes such as their opinions about sour and bitter of a food item, given the sour-bitter confusion of children. The recommended evaluation techniques included pictorial or simple work scales with adult participation recommended (ASTM's Committee 18 on Sensory Evaluation; Guinard, 2000). Children 2-3 years old were found not to be able to perform a paired-comparison for sweetness; and children 4-10 years old were found to be more able to correctly identify the level of sweetener of tested beverages (Guinard, 2000). Our sample has 32 children who were under 8 years old (34% of the sample) and 5 children under 3 years old (5% of the sample). Thus, the questions we used were pictorial and simple work scales and parents participated in the entire taste testing and completed the questionnaire with their children.

Table 1. Cognitive skills of children 5-8 years old (ASTM's committee 18 on sensory evaluation)

Cognitive Skills of Children 5-8 Years Old (ASTM's Committee 18 on Sensory Evaluation)				
Language:	verbal,	Moderately developed verbal and vocabulary skills;		
reading/written	language	understanding increases. Early reading and writing		Limited by understanding of
Vocabulary		skills, may still require adult assistance for some tasks.	Attention span	task and interest level
		Developing with increased learning, cause/effect	Decision	Ability to Decide is
Reasoning		concepts	making	increasing, but influence of
				adult approval is evident.
				Gross motor skills developed,
Understanding scales		Scale understanding increasing, simple is best	Motor skills	fine skills becoming more
		Previous, plus: simple attribute ratings. Liking		refined
Recommended evaluation	scales-pictorial or simple work	scales. Group	Adult	Previous, plus: self
technique	discussions. Concept testing		involvement	administered

It is believed that food preference was developed in the first 2-3 years of life with about 70% of food preference already established in early childhood. Therefore, children's preference is said to be greatly affected by their parents (Cashdan, 1994). Laing et al. (1999) compared adult and children's meat-eating habits and found that children eat similar meats to those of 14-16 years old females and the only differences is the frequency and quantity of consumption. Other studies conclude that children have different food preference across age groups. De Graaf and Zandstra (1999) concluded that children 9-10 years old preferred higher concentration levels of sugar in water and lemonade than adolescents of 14-16 years old. Temple et al. (2002) found that children 8 to 9 year-olds express higher estimates than adults for the maximum sweetness of orange drink and custard and these children recorded shorter sweetness durations with orange drink and custard. Studies have also suggested that perceptions of tastes are different in adults and children, which affect their acceptability of a food (Temple et al. 2002). To clearly understand children and parents' taste preference for salmon, this study required the two groups to complete the survey independently.

Recent research has suggested that food insecurity is the most significant issue that has affected children's food behavior (Loring et al., 2012). Though food insecurity rate for children is unknown, the overall food insecurity rate for Alaska's households was found to be about 14% (Feeding America, 2014). In fact, a survey with households in Kenai Peninsula revealed a high rate of 27% of Alaskan households who are in some degree of food insecurity (Loring et al., 2012). Food insecurity for low-income household is even more dramatic. An early study has pointed out that for many low-income families in Alaska, "a lack of resources limited the ability to provide enough food at certain times each month or during the year, such as the end of the month or during the summer when school meals were not provided. Children from households that reported hunger were more likely to suffer from health problems and to miss school" (Story et al., 1998). Poverty was found to limit access to healthful foods and consequently increases the consumption of high-fat and high-sugar foods (Broussard et al., 1995).

Even though fish has been recommended by doctors in the aim to promote healthful eating and prevent cardiovascular diseases (Simopoulos, 2008), research on children's fish choice is still in its infant stage. Published studies have only recently revealed that consumers consider fish appearance and meat texture when making consumption decisions (Claret et al., 2012; Xu et al., 2012). For example, fish appearance and texture of meat were found to greatly affect Chinese consumers' seafood consumption decisions (Xu et al., 2012). One previous study also concludes that consumers prefer fish that has a good taste (Myrland et al., 2000). However, none of the aforementioned studies draw the conclusions from taste test data and none of them are about children.

Only a paucity of research has studied children's fish preference. Altintzoglou et al. (2010) interviewed parents and their children (3-13 years old) who consume seafood less than twice per week in Norway and Iceland and less than once per week in Denmark. Their results show that school meals have a major negative influence on fish consumption at home such that parents are reluctant to have their children eat more fish at home because their child has already eaten fish two to three times that week at school. Children described that having seafood as a negative experience if they are fed seafood "almost everyday" or "five times a week". Additionally, parents feel that it is difficult to convince their children to eat seafood if peer influence at school results in negative attitudes towards seafood consumption (Ross, 1995). Consequentially, parents have to decrease the frequency of

seafood meals at home. The study also concludes that both high and low consumption of seafood during childhood has a negative influence on seafood consumption on the child's later life and that for parents and school food service professionals finding balanced seafood consumption frequency is a key to improve child's later life seafood consumption. Recently, Altintzoglou et al. (2014) used taste test choice experiment data gathered from children 11-12 years old to understand how availability of food choice option increases children's liking of fish. Participating children were provided with cod or salmon meal or cod and salmon meal during the taste test. Their study concluded that providing children with an option to choose fish increases the liking of fish. Similarly, a study examining adult Danish consumers' fish preference revealed that the bigger the choice set of fish being presented to consumers the higher the possibility of a fish item being chosen. Consumers are less likely to choose a fish product if they are provided with a small choice set (Rortveit & Olsen, 2007). This study ensures that adults participated in the taste testing with their children and then answered the survey, and this was recommended by the literature (Cashdan, 1994). Data from the children as well as parents were used due to the consideration that children have similar preference as their parents and thus parents' preference information can be used as an indicator of food preference of their children (Cashdan, 1994). Given the fact that our data are not paired, our study cannot answer the question of whether a specific child have the same preference as her parents on salmon choice. However, our sample can be used to address the aforementioned four research goals.

3. Methods

According to Lancaster (1966), consumption utility is derived from a product's characteristics rather than the product *per se* and the characteristics combination contributes to the overall consumption utility. Salmon meals being taste tested can be viewed as a collection of selected attributes: appearance, flavor, texture, and saltiness. These attributes were included as a result of a literature review (Wadolowska et al., 2008; Köster, 2009; Xu et al., 2012; Gaviglio et al., 2014). According to Lancasterian approach, consumers will choose these attributes bundles to maximize his/her utility in a budget constraint. To modeling, the utility associated with the i^{th} consumer U_i ($i=1, \dots, I$) who derives from the j^{th} salmon alternative (out of a given choice set of C) can be a function of the selected attributes of the alternative j (Lancaster, 1966):

$$U_{ij} = \beta x_{ij} + \varepsilon_{ij} \quad (1)$$

where β is a vector of unknown parameters for the selected attributes; x is a vector of selected attributes for product j chosen by consumer i ; and ε is a stochastic error term resulted from measurement errors. In the case of the salmon taste test, we set up the utility function as:

$$utility = \alpha + \beta_1(\text{gender}) + \beta_2(\text{appearance}) + \beta_3(\text{flavor}) + \beta_4(\text{texture}) + \beta_5(\text{saltiness})$$

$$utility = \alpha + \beta_1(\text{gender}) + \beta_2(\text{frequency}) + \beta_3(\text{appearance}) + \beta_4(\text{taste}) \quad (3)$$

This discrete random utility model is then used to calculate the probability P_{ij} that individual i will choose alternative j from choice set C . This probability is said to equal to the probability that the utility associated with choice j is greater than the utility associated with all other k choices in the same set (McFadden, 1975; Greene, 2011). The model assumes the error terms ε are independent and identically distributed with the Weibull (Gnedenko, extreme value) distribution (McFadden, 1974). So from the probit model, P_{ij} is:

$$P_{ij} = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{(\alpha + \beta x_{ij})} e^{-\frac{1}{2}z^2} dz \quad (4)$$

Where x represents selected product attributes, z is the z score, and α, β are parameters of interest. Marginal

effects are computed using $\frac{\partial P_{ij}}{\partial x_{ij}}$, to calculate the impact of each selected attribute x_{ij} on probability P_{ij} ,

taking into account of the parameter estimates and the values of all other variables.

To identify appropriated salmon meals to be tested with children and parents, focus group discussions with school food service personnel, processing facility personnel and other school food service stakeholders were conducted. This focus group discussion suggested the removal of salmon chowder/soup from list of ideas as it would be difficult to keep the sodium level low while maintaining good flavor. It was also mentioned in the discussion that kids often do not like soup as much as other food forms. Later, the selected and adjusted recipes

were taste tested again with a second focus group and finalized with the third focus group.

Data were gathered on August 4, 2012 at Tanana Valley Fair in Fairbanks. This state fair presented us a good opportunity to recruit diverse participants. To facilitate this one-day event, all recipes needed were prepared and tasted on a large scale at a specific facility in which the product will be produced in the future to make any necessary final adjustments. The finalized products were large-scale taste tested at this state fair to gather survey data and opinion information to understand whether the recipes were well-liked by children and parent. The consumer test was originally slated to be carried out in a pilot school. However, due to the time of year that the consumer test was conducted was August, we were unable to work with a specific school and instead designed our test to be carried out at the Tanana Valley Fair.

To best determine the ‘multiple uses’ of the recipe (see Figure 1), we taste tested three different recipes. The first recipe was the plain patty to provide feedback on the basic form of the recipe. The second recipe is a salmon patty on a 51% whole grain bun with garlic aioli, Alaska grown lettuce and tomato. The third recipe is a salmon ball on a bed of brown rice with sweet and sour sauce (Figure 1).



Plain Patty



salmon on bed of brown rice with sweet and sour sauce



salmon patty on a 51% whole grain bun with garlic aioli

Figure 1. The three salmon meals taste tested on august 4, tanana valley state fair in fairbanks

We provided separate evaluation forms for children under 18 and adults. A separate evaluation form was used for each recipe. For the children’s form we used a 5-point hedonic scale to obtain feedback on the appearance and taste of each specific recipe. We also asked if they would eat that specific product again and if they would like it served in their school lunch. The adult form used both 5-point and 6-point hedonic scales to obtain feedback. Adults provided feedback on appearance, flavor, texture and saltiness of each product. They were also asked if they would eat the food again, if they thought their child (if applicable) would like it and if they would like to see it served in their student(s)’ school lunch. Both children and adults were asked to provide additional feedback in the comments section if desired. We received 93 useful surveys from children and 118 surveys from parents.

We utilized low-grade Chum (also known as Dog or Keta) salmon. By utilizing the lowest grade of salmon, we are able to determine that the lower quality ingredients of the recipe will still provide a tasty product for individuals. It also indicates that the affective status of this recipe will only improve as the quality of salmon improves.

4. Results and Discussions

Participating children’ and parents’ demographics are shown in Table 2. The average age of participating students is 8.51 years old. A total of 58 students completed the survey themselves, 33 students had their parents filled out the survey for them, and two completed survey did not indicate the person who filled it out. The average age of these parents who helped their children to complete the survey is 45.24 years old. The sample contains more girls (54%) than boys (45%) students and a majority of the participating children liked fish in general (88%). Fewer than 50% of the participating children had experience eating school lunch for at least some days (46%); 50% of them had never had school lunch. More female parents participated in the survey than male parents (57% vs. 43%) and 99% of these parents indicated that they liked fish in general. This above information was asked as the general information and participating parents and students answered these questions before they started to taste test the salmon meals.

Table 2. Demographic profile of participating students and parents

Student Profile		Mean	Standard Deviation	Count
Age	Children age	8.51	3.92	58
	Adult age	45.24	15.98	33
Total		--	--	91
Gender	Boy	--	--	41
	Girl	--	--	51
	Missing value	--	--	1
Total		--	--	93
Like fish or not	Yes	--	--	82
	No	--	--	8
	Missing value	--	--	3
Total		--	--	93
Frequency eating school lunch	Every day	--	--	7
	Most days	--	--	10
	Some days	--	--	25
	Never	--	--	47
	Missing value	--	--	4
Total		--	--	93
Parents Profile		Count		
Gender	Male	51		
	Female	67		
Total		118		
Like fish or not	Yes	117		
	No	1		
Total		118		

Students' taste test results appear in Table 3. After observing and tasting the three products, more students selected salmon burger (48%) rather than the salmon patty (32%) and salmon ball (26%) as the fish item that was delicious and that they really wanted to eat. Compared to the salmon burger (48%), fewer students tasted the salmon ball product as delicious (26%), but many students thought salmon ball "looks good" (34%) or "looks ok" (22%). Students liked the appearance of the meals and only a few of them thought the meals "looks bad" or "looks very gross". In summary, after taste testing the meals, above 50% of participating students perceived the three fish items as attractive and above 70% of these students were willing to taste the products. Salmon burger was rated the highest because of its delicious taste and salmon ball was liked mainly because of its appearance (Table 3). Thus, the Salmon burger was considered as having the most potential to increase children's salmon consumption.

Table 3. Taste test results of students

	Salmon Patty Count	Salmon Burger Count	Salmon Ball Count
What do you think of this food? How does it look to you?			
Delicious! I really want to eat it.	29	45	24
It looks good.	22	20	32
It looks ok.	23	11	20
It looks bad.	0	2	1
It looks very gross. I do not want to eat it.	0	4	5
Missing value	19	11	11
Total	92	93	93
Will you taste this food?			
Yes	67	70	74
No	2	4	2
Missing value	24	19	17
Total	93	93	93
If you tasted this food, what did you think of it?			
I liked it a lot. Yam!	32	47	27
I liked it.	22	12	16
It was ok.	8	11	18
I did not like it.	4	2	12
I really did not like it. Gross.	1	2	2
Missing value	26	19	18
Total	93	93	93
Do you want to eat this food again?			
Yes	44	54	44
No	8	10	18
Maybe	17	12	15
Missing value	24	17	16
Total	93	93	93
Do you want this food to be served in your school lunch?			
Yes	43	51	39
No	10	12	20
Maybe	14	10	17
Missing value	26	20	17
Total	93	93	93
Would you change anything about this food?			
Yes	12	14	18
No	50	52	52
Maybe	7	5	7
Missing value	24	22	16
Total	93	93	93

After the taste testing, students were asked what they thought about the fish items (Table 3). More students liked the salmon burger (51%) than salmon patty (34%) and salmon ball (29%). Thirteen percent of participating students did not like the salmon ball product and the reported reasons included: it was too much fish taste; too dry; needed more seasoning; or rice provided with it was not good. Many students were willing to eat the salmon burger again (58%) with fewer of them wanted to eat the salmon ball (48%) and salmon patty (47%) again. More students wanted to see the salmon burger to be served at their school lunch (55%) and fewer of the students wanted the salmon patty (46%) and salmon ball (42%) to be served in their school lunch. Many students wanted the salmon ball product to be changed to improve its taste (19%): make it more moister; add more salt and dill; and make the rice tastier. Fewer students wanted the salmon burger (15%) and salmon patty (13%) to be changed.

Parents' taste test results are shown in Table 4. A majority of parents (88% or above) considered the three fish items "delicious", and looks "good" and "OK". Parents' observations about the appearance of the fish items are

similar as their children: salmon burger was the most preferred due to its good taste, followed by salmon patty and the salmon ball was the least preferred according to the taste (Table 4). According to the look, salmon ball was liked: 66% of parents thought the salmon ball looked good or OK.

Table 4. Parents' taste test results

	Salmon Patty		Salmon Burger		Salmon Ball	
	Count	%	Count	%	Count	%
What do you think of this food? How does it look to you?						
Delicious!	41	34%	58	49%	31	26%
Looks good.	50	42%	45	38%	50	42%
Looks ok.	15	12%	5	4%	28	24%
Looks bad.	0	0%	1	1%	2	2%
Looks gross.	0	0%	1	1%	0	0%
Missing	12	12%	8	7%	7	6%
Total	118	100%	118	100%	118	100%
Will you taste this food?						
Yes	103	87%	107	91%	110	93%
No	1	1%	1	1%	2	2%
Missing	14	12%	10	8%	6	5%
Total	118	100%	118	100%	118	100%
Please rate the following attributes on a scale of 1-6						
	Flavor	Texture	Flavor	Texture	Flavor	Texture
1	2 (2%)	1 (1%)	2 (2%)	2 (2%)	3 (3%)	1 (1%)
2	2 (2%)	2 (2%)	2 (2%)	2 (2%)	7 (6%)	4 (3%)
3	4 (3%)	5 (4%)	7 (6%)	4 (3%)	14 (11%)	16 (14%)
4	15 (13%)	17 (15%)	14 (12%)	12(10%)	29 (24%)	24 (20%)
5	46 (39%)	37 (31%)	28 (24%)	31(27%)	31 (26%)	33 (28%)
6	35 (30%)	38 (32%)	56 (48%)	52(45%)	28 (24%)	28 (24%)
Missing	14 (11%)	18 (15%)	9 (6%)	15(11%)	6 (6%)	12 (10%)
Total	118	118	118	118	118	118
Saltiness						
Not enough	25	21%	17	14%	33	28%
Perfect	65	55%	78	66%	61	52%
Too salty	1	1%	1	1%	3	3%
Missing	27	23%	22	19%	21	18%
Total	118 (100%)	0%	118	100%	118	100%
Would you eat this food again?						
Yes	82	70%	87	74%	67	57%
No	4	3%	2	2%	15	13%
Maybe	5	4%	7	6%	15	13%
Missing	27	23%	22	19%	21	18%
Total	118	100%	118	100%	118	100%
Would you want this food to be served in your student's school lunch?						
Yes	80	68%	83	70%	65	55%
No	4	3%	3	3%	12	10%
Maybe	6	5%	9	8%	20	17%
Missing	28	24%	23	19%	21	18%
Total	118	100%	118	100%	118	100%
Would you change anything about this food?						
Yes	19	16%	19	16%	36	31%
No	59	50%	65	55%	41	35%
Maybe	13	11%	11	9%	18	15%
Missing	27	23%	23	19%	23	19%
Total	118	100%	118	100%	118	100%

Parents were asked to rate the flavor and texture of the product on a 1-6 scale (Table 4). More parents rated salmon burger the highest score in flavor (48%) and texture (45%) compared to salmon patty (30%, 32% respectively) and salmon ball (24% and 24% respectively). Some parents believed salmon ball needs more salt (28%); but more parents thought it was perfectly salted (52%). More parents wanted to eat the salmon burger again (74%) and they wanted the salmon burger to be served in their students' school lunch (70%). In contrast, fewer parents wanted the salmon patty (68%) and salmon ball (55%) to be served at school lunch. There were also about one third (31%) of participating parents wanted the salmon ball to be changed by adding more flavors and more moister, and making it bite-sized.

The probit results in regards to parents' recommendations are presented in Table 5. When asked if they would want three salmon meals to be served in their students' school lunch, these parents tended to answer 'yes' if they liked the flavor of the items. This conclusion is drawn because of the flavor variable, which has a statistically significant and positive impact on the dependent choice variable ($\alpha < 1\%$) for all three products. Thus, flavor rating has a significant and positive impact on parents' choice to have the salmon meals served in the school lunch. Marginal effect is 4% across the three fish items: if a parent's flavor rating goes up by one point, she is 4% more likely to vote for the salmon meal to be served at her child's school. Texture rating significantly affects parents' decision on having salmon burger and salmon patty to be served in school lunch. But the impact is on opposite directions. If the parent's texture rating goes up by one more point, she is 4% less likely to recommend the salmon burger to be served at school lunch. But one point increase will result in a 3% increase in possibility to recommend the salmon patty to be served in the school lunch. The negative impact of texture preference on salmon burger recommendation may be explained by the fact that parents believed that their children had different texture preference in regards to salmon burger. Therefore, parents would make recommendations according to their children's texture preference. This different texture preference between parents and children was previously observed: mothers preferred harder foods and those containing more particles than children who prefer foods that are softer with fewer particles (Lukasewycz & Mennella, 2012). Perhaps to respond to the preference difference, our parents tended not to recommend the salmon burger to be served in school lunch if they believed its texture was more tailored to the taste of adults. These parents observed the salmon patty in a different way: they may consider the texture of this product as something desirable to children. Their positive ratings would lead to greater recommendations to have the salmon patty served in their children's school lunch.

Table 5. Factors affecting parents' opinions to serve the fish items in school lunch

		Salmon Patty	Salmon Burger	Salmon Ball
Dependent V:	would you want this food to be served in your student's school lunch? Yes=1; No=0			
Independent	Coding	Coefficients	Coefficients	Coefficients
Gender	Man=1; Woman=2	0.03 (0.04)	0.05 (0.05)	0.05 (0.07)
Appearance	1=delicious; 2=look good;	0.05 (0.04)	-0.02 (0.05)	-0.003 (0.05)
	3=look ok; 4=look bad;			
Flavor	5=look gross.	0.10*** (0.04)	(0.04)	0.13*** (0.04)
	1-6 with 1=dissatisfied, 6=highly satisfied			
Texture:	1-6 with 1=dissatisfied,	0.05* (0.03)	-0.11 *** (0.04)	0.043 (0.05)
	6=highly satisfied			
Saltiness	1=not salty enough;	0.07 (0.05)	0.10 (0.24)	0.10 (0.07)
	2=perfect;			
R square	3=too salty	0.39	0.36	0.41
observations		76	66	63

Numbers in the parentheses are standard errors; * means statistically significant at 10% level and *** at 1% level.

Factors affecting students' lunch service recommendations were examined and results are shown in Table 6. Appearance is the only one attribute that has a significant effect on children's recommendations for the salmon patty product. If students liked the appearance of the salmon patty item, they were 0.5% more likely to recommend the item to be served in their school lunch program ($\alpha < 0.05$). This variable has no impact on their choice of salmon burger and salmon ball. None of other selected attributes have significantly changed students' lunch service recommendations for the three items. This seems to indicate that appearance is the only

factor that affects students' salmon choice. Appearance of a fish item is so important to affect a student's decision to improve the food to their like. Before they taste test the food, if they feel the food's appearance is not acceptable, they would not want to taste it. If students like the appearance of the fish item, they are likely to taste test it (88%). After taste testing the food, if a student like the appearance of the item, she is more likely to recommend the meal to be served at school lunch.

Table 6. Factors affecting students' opinions to serve the fish items in school lunch

		Salmon Patty	Salmon Burger	Salmon Ball
Dependent V: would you want this food to be served in your student's school lunch? Yes=1; No=0				
Independent	Coding	Coefficients	Coefficients	Coefficients
Gender	boy=1; girl=2	-0.16 (0.11)	-0.002 (0.006)	-0.01 (0.13)
Frequency eating school lunch	1=every day; 2=most days; 3=some days; 4=never	0.002 (0.004)	0.002 (0.004)	0.003 (0.003)
Appearance	1=delicious; 2=look good; 3=look ok; 4=look bad; 5=look gross.	-0.01** (0.005)	0.002 (0.003)	0.0003 (0.007)
Taste	1=like it a lot; 2=liked it; 3=ok; 4=did not like it; 5=gross	0.01 (0.005)	0.001 (0.003)	0.002 (0.005)
R square		0.11	0.01	0.03
observations		53	63	59

Numbers in the parentheses are standard errors; ** means statistically significant at 5% level.

Table 7. Parents' perceptions about how students like the fish

		Salmon Patty	Salmon Burger	Salmon Ball
Dependent: Do you think your student will like this food? Yes=1; No=0				
Independent	Coding	Coefficients	Coefficients	Coefficients
Gender	Man=1; Woman=2	-0.04 (0)	-4.29 (0)	2.19 (0.77)
Appearance	1=delicious; 2=look good; 3=look ok; 4=look bad; 5=look gross.	-0.11 (0)	-0.86 (0)	-0.62 (-0.22)
Flavor	1-6 with 1=dissatisfied, 6=highly satisfied	0.59 (0.02)	1.13 (0)	1.67** (0.60)
Texture:	1-6 with 1=dissatisfied, 6=highly satisfied	0.71 (0.03)	1.08 (0)	1.24 (0.44)
Saltiness	1=not salty enough; 2=perfect; 3=too salty	-6.05*** (0.04)	0.18 (0)	1.43* (0.50)
Constant		(2.28)	(4.72)	-17.31 ** (8.32)
Prob>chi ²		<0.0001	<0.0002	<0.0001
Log likelihood		-9.91	-5.77	-7.38
Number of observations		68	72	55

Numbers in the parentheses are marginal effects for selected attributes and are standard errors for constant terms; * means statistically significant at 10% level;** at 5%; and *** at 1% level.

Parents were asked if they believe their students will like the salmon meals (Table 7). Flavor and saltiness are two factors significantly affecting parents' perceptions about their students' salmon ball preference. Marginal effects indicate that if parents were highly satisfied with the flavor of the salmon ball, they will be 60% more likely to think that their student would like this item. Thus, parents believed that flavor determines children's salmon ball choices. However, this flavor variable was not significant in terms of changing parents' perceptions about how their student like salmon patty and salmon burger.

Interestingly, if parents thought the salmon ball is too salty, they will be 50% more likely to believe that their student would like it. This seems to show that parents believed that their students liked salty salmon ball rather than the plain alternative. None other selected variables significantly predicted parents' perceptions about their students salmon choices. The significant constant estimates suggest that there are other attributes that can explicate the variation in the dependent variables, but these attributes were not included in this estimation.

Parents' decision to change anything about the fish items are examined (Table 8). Saltiness is the only attribute that negatively affected parents' decisions to change all three salmon meals. Thus, if parents perceived the three meals were too salty, they were less likely to suggest a change about the food. Marginal effects further explain that if parents believed, for example, the salmon patty were too salty, they were 56% less likely to recommend a change. This may be explained by the fact that many parents thought the three meals were too bland and needed more salt. Parents' gender was found to positively affect recommendation making for salmon patty: a female parent is 27% more likely to suggest a change than a male parent.

Table 8. Factors affecting parents' decision to change anything about the fish

Dependent: Would you change anything about this food? Yes=1; No=0		Salmon Patty	Salmon Burger	Salmon Ball
Independent	Coding	Coefficients	Coefficients	Coefficients
Gender	Man=1; Woman=2	1.13* (0.27)	0.66 (0.18)	-0.05 (-0.02)
Appearance	1=delicious; 2=look good; 3=look ok; 4=look bad; 5=look gross.	-0.39 (-0.10)	-0.07 (-0.02)	-0.14 (-0.06)
Flavor	1-6 with 1=dissatisfied, 6=highly satisfied	-0.29 (-0.07)	-0.55* (-0.15)	-0.25 (-0.10)
Texture:	1-6 with 1=dissatisfied, 6=highly satisfied	-0.18 (-0.05)	-0.08 (-0.02)	-0.48** (-0.19)
Saltiness	1=not salty enough; 2=perfect; 3=too salty	-2.29*** (-0.56)	-1.17* (-0.32)	-0.60* (-0.24)
Constant		4.36** (1.74)	3.59* (1.98)	4.66*** (1.54)
Prob>chi ²		<0.0001	<0.0001	<0.0001
Log likelihood		-21.94	-26.35	-33.83
Number of observations		74	75	69

Numbers in the parentheses are marginal effects for selected attributes and are standard errors for constant terms. * means statistically significant at 10% level; ** at 5%; and *** at 1% level.

Besides the common negative impact of saltiness on parents' recommendations, flavor was found to negatively affect the recommendation for the salmon burger (Table 8): if parents were highly satisfied with the flavor of this item, they were 15% less likely to recommend a change about this item. For the salmon ball, parents were 19% less likely to recommend a change if they liked the texture of this food. For all three meals, appearance, which had positively affected students' recommendations, was found no impact on parents' recommendation makings.

Factors affecting students' opinions to improve the salmon meals were analyzed and the results are shown in Table 9. First, gender seems matter. A female student is 2% more likely to recommend a change than a male student, in the case of the salmon patty choice. Second, those who frequently eat school lunch are 2% less likely to recommend a change for the salmon patty meal compared to someone who eats school lunch less often. Third, the appearance attributes again shows a statistically significant impact on the change decision: if a student thought the salmon patty looked delicious, she/he was 1% more likely to recommend a change. Fourth, if a student did not like the taste of the salmon patty, she/he is 1% more likely to recommend a change. As to the salmon burger and salmon ball products, none of the selected attributes were found to affect students' recommendations.

Table 9. Factors affecting students' decision to change anything about the fish

		Salmon Patty	Salmon Burger	Salmon Ball
Dependent: Would you change anything about this food? Yes=1; No=0				
Independent	Coding	Coefficients	Coefficients	Coefficients
Gender	boy=1; girl=2	1.02* (0.02)	-0.05 (-0.01)	0.12 (0.04)
Frequency eating school lunch	1=every day; 2=most days; 3=some days; 4=never	0.97** (0.02)	-0.01 (0)	-0.01 (0)
Appearance	1=delicious; 2=look good; 3=look ok; 4=look bad; 5=look gross.	-0.79** (-0.01)	-0.22 (-0.04)	0.01 (0)
Taste	1=like it a lot; 2=liked it; 3=ok; 4=did not like it; 5=gross	0.78*** (0.01)	0.21 (0.04)	-0.01 (0)
Constant		-6.06 (2.32)	-0.65 (0.66)	-0.82 (0.58)
Prob>chi ²		<0.0003	0.23	0.94
Log likelihood		-20.02	-31.31	-39.52
Number of observations		62	66	70

Numbers in the parentheses are marginal effects for selected attributes and are standard errors for constant terms. * means statistically significant at 10% level; ** at 5%; and *** at 1% level.

5. Conclusions and Further Research Implications

The primary objective of this study is to understand factors affecting Alaska children's as well as their parents' salmon preference. Improving salmon consumption among Alaska children is feasible given the abundant salmon resource in Alaska. This study taste tested three newly developed fish recipes made from the low-grade Chum (also known as Dog or Keta) salmon. The three selected salmon recipes were large-scale taste tested with students and their parents in a state fair. Most students and parents thought the fish items were appealing and they were willing to taste the meals. According to the appearance and mouth feel of the products, students rated the salmon burger as most preferred, followed by the salmon patty, and the salmon ball. Parents rated the three products in the same preference order, but for different reasons. Parents' preference seems to be affected by good flavor, texture, and appropriate saltiness. Many students and parents wanted to eat the three fish items again and wanted to have these meals served at their school lunch. Again, parents and students alike affirmed that salmon burger as their most desirable recipe. The results elaborate that students and parents tended to rate similarly for a specific item, even though are sample are not paired. This finding seems to illustrate similar fish likings of children and their parents. Perhaps parents' salmon preference had influenced their children and this impact has been carried out in a family occasion. If so, it seems reasonable to refer to parents' salmon preference when analyzing their children's salmon likings. Nevertheless, this study used unpaired data and was not designed to examine why parents and children may have similar salmon consumption preference. It was intended to identify some similarities and differences in salmon preference of students and parents for the selected recipes. To this goal, our results suggest that there are consumption similarities in between the two groups. However, this study has limitations. The results from this study are drawn from the three salmon recipes only and these results may not represent consumption preference of other salmon items.

Difference was uncovered. First, food appearance seems to greatly predict students' opinions to serve the fish items in school lunch and to improve the item. Another study found this product appearance attribute to be an appropriate predictor of students' likings for pork chops, sausages, and steak (Rose et al., 2004). The results seem to reflect that children tend to use visual indicators to evaluate food products. Thus, when the salmon meal looked appealing to them, they are more willing to give it a try. Second, taste was another attribute that shows a major impact on students' decision to recommend a change of a salmon meal. This mouth feel variable was also found to impact students' consumption preference of pork chops, sausages and steak (Rose et al., 2004). Thus, to school food service providers and salmon manufactures that supply school meals, serving salmon items that appear attractive and that taste good may improve salmon consumption. Future studies may further this topic by exploring students' definition of appealing and good taste of a salmon item.

Flavor was the most important factor that changes parents' opinions about the three salmon items. If parents like the flavor of the fish items, they were likely to suggest an improvement and make the meals more suitable for the school lunch. Texture was the second attribute that affected parents' recommendations. Moreover, parents tended

to carefully consider saltiness of the meals when proposing a change to improve the item to their children's likings. Interestingly, the appearance attribute that greatly affected students' fish choices, had no impact at all on parents' choice. The findings suggest that to make the fish items attractive to parents, attention should be paid on product flavor, texture, and saltiness level. It should also be noted that parents often make the fish choices for the children. Therefore, understanding parents' fish choice is utmost important to improve children's salmon consumption. In most cases, if parents choose for their children, they usually would consider the salmon preference of their children. Thus, sharing the results of this study with parents and helping parents understand that their children care about both appearance and taste of the salmon items, may improve children's salmon consumption at home. Our results also seem to indicate that parents thought the fish items taste tested were not salty enough for their children. Given saltiness was not a factor included in the students survey, this input from parents should be carefully considered and be addressed in future salmon taste test studies.

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References

- Altintzoglou, T., Hansen, K. B., Valsdottir, T., Odland T. O., Martinsdottir, E., Brunso, K., & Luten, T. (2010). Translating Barriers into Potential Improvements: The Case of New Healthy Seafood Product Development. *Journal of Consumer Marketing*, 27(3), 224-235.
- Altintzoglou, T., Skuland, A. V., Carlehog, M., Sone, I., Heide, M., & Honkanen, P. (2014). Providing A Food Choice Option Increases Children's Liking of Fish As Part of A Meal. *Food Quality and Preference*.
- Barthomeuf, L., Rousset, S., & Droit-Volet, S. (2009). Emotion and food: do the emotions expressed on other people's faces affect the desire to eat liked and disliked food products? *Appetite*, 52(1), 27-33.
- Birch, D., & Lawley, M. (2012). Buying Seafood: Understanding Barriers to Purchase Across Consumption Segments, *Food Quality and Preference*, 26, 12-21.
- Broussard, B. A., Sugarman, J. R., Bachman-Carter, K., Booth, K., Stephenson, L., Strauss, K., & Gohdes, D. (1995). Toward Comprehensive Obesity Prevention Programs in Native American Communities. *The American Journal of Clinical Nutrition*, 53, 1535S-1542S.
- Cashdan, E. (1994). A sensitive period for learning about food. *Human Nature*, 5, 279-291.
- Claret, A., Guerrero, L., Aguirre, E., Rancon, L., Hernandez, M. D., Martinez, I., Peleteiro, J. B., Grau, A., & Rodriguez-Rodriguez, C. (2012). Consumer Preferences for Sea Fish Using Conjoint Analysis: Exploratory Study of the Importance of Country of Origin, Obtaining Method, Storage Conditions and Purchasing Price. *Food Quality and Preference*, 26, 259-266.
- De Graaf, C., & Zandstra, E. H. (1999). Sweetness Intensity and Pleasantness in Children, Adolescents, and Adults. *Physiology & Behavior*, 67(4), 513-520.
- Dewailly, E. G. M., Pedersen, H., Hansen, J., Behrendt, N., & Hansen, J. (2003). Inuit are protected against prostate cancer. *Cancer epidemiology, Biomarkers and Prevention*, 12(1), 926-927.
- Feeding America: Map the Meal Gap. (2014). Retrieved from <http://feedingamerica.org/hunger-in-america/hunger-studies/map-the-meal-gap.aspx>
- Gaviglio, A., Demartini, E., Mauracher, C., & Pirani, A. (2014). Consumer Perception of Different Species and Presentation Forms of Fish: An Empirical Analysis in Italy. *Food Quality and Preference*, 36, 33-49.
- Greene, H. W. (2011). *Econometric Analysis* (7th ed.). Prentice Hall.
- Guinard, J. X. (2000). Sensory and Consumer Testing with Children. *Trends in Food Science & Technology*, 11, 273-283.
- Köster, E. P. (2009). Diversity in the determinants of food choice: A psychological perspective. *Food Quality and Preference*, 20(2), 70-82.
- Laing, D. G., Oram, N., Burgess, J., Ram, P. R., Moore, G., Rose, G., Hutchinson, I., & Skurray, G. R. (1999). The Development of Meat-eating Habits during Childhood in Australia. *International Journal of Food Sciences and Nutrition*, 50, 29-37.
- Loring, P. A., & Gerlach, S. C. (2009). Food, Culture, and Human Health in Alaska: An Integrative Health Approach to Food Security. *Environmental Science*, 12, 466-478.

- Loring, P. A., Duffy, L. K., & Murray, M. S. (2010). A Risk-Benefit Analysis of Wild Fish Consumption for Various Species in Alaska Reveals Shortcomings in Data and Monitoring Needs. *Science of the Total Environment*, 408, 4532-4541.
- Loring, P. A., Gerlach, S. C., & Harrison, H. L. (2012). *Food Security on the Kenai Peninsula, Alaska: A Report on Local Seafood Use, Consumer Preferences, and Community Needs*. Retrieved from <http://ine.uaf.edu/werc/wp-content/uploads/2013/02/Loring-et-al-2012-Kenai-Peninsula-Food-Security-Report-vfinal.pdf>
- Lukasewycz, L. D., & Mennella, J. A. (2012). Lingual Tactile Acuity and Food Texture Preferences among Children and Their Mothers. *Food Quality and Preference*, 26, 58-66.
- Mozaffarian, D., & Rimm, E. B. (2006). Fish Intake, Contaminants, and Human Health—Evaluating the Risks and the Benefits. *Journal of the American Medical Association*, 296(15), 1885-1899.
- Myrland, O., Trondsen, T., Jahnston, R. S., & Lund, E. (2000). Determinants of Seafood Consumption in Norway: Lifestyle, Revealed Preferences, and Barriers to Consumption. *Food Quality and Preference*, 11, 169-188.
- Rortveit, A. W., & Olsen, S. O. (2007). The Role of Consideration Set Size in Explaining Fish Consumption. *Appetite*, 49, 214-222.
- Rose, G., Laing, D. G., Oram, N., & Hutchinson, I. (2004). Sensory Profiling by Children Aged 6-7 and 10-11 Years. Part 1: A Descriptor Approach. *Food Quality and Preference*, 15, 585-596.
- Ross, S. (1995). Do I Really Have to Eat That?: A Qualitative Study of Schoolchildren's Food Choices and Preferences. *Health Education Journal*, 54, 312-321.
- Sidhu, K. S. (2003). Health Benefits and Potential Risks Related to Consumption of Fish or Fish Oil. *Regulatory Toxicology and Pharmacology*, 38(3), 336-344.
- Simopoulos, A. P. (2008). The importance of the omega-6/omega-3 fatty acid ratio in cardiovascular disease and other chronic diseases. *Experimental Biology and Medicine*, 233(6), 674-688.
- Story, M., Strauss, K. F., Zephier, E., & Broussard, B. A. (1998). Nutritional Concerns in American Indian and Alaska Native Children: Transitions and Future Directions. *Journal of the American Dietetic Association*, 98(2), 170-176.
- Temple, E. C., Laing, D. G., Hutchinson, L., & Jinks, A. L. (2002). Temporal Perception of Sweetness by Adults and Children Using Computerized Time-Intensity Measures. *Chemical Senses*, 27, 729-737.
- Verbeke, W., & Vackier, I. (2005). Individual Determinants of Fish Consumption: Application of the Theory of Planned Behavior. *Appetite*, 44, 67-82.
- Wadolowska, L., Babicz0Zielinska, E., & Czarnocinska, J. (2008). Food Choice Models and Their Relation with Food Preferences and Eating Frequency in the Polish Population: POFPRES Study. *Food Policy*, 33, 122-134.
- Wadsworth, B. J. (1984). *Piaget's Theory of Cognitive and Affective Development* (3rd ed.). New York: Longman.
- Xu, P., Quentin, F., Andrea, B., & Betty, I. (2015). Fisheries-to-School in Alaska: A Food Service Directors' Perspective. *International Journal of Business and Management*, 10(2), 142-149.
- Xu, P., Zeng, Y. C., Fong, Q., Lone, T., & Liu, Y. Y. (2012). Chinese Consumers' Willingness to Pay for Green-and Eco-labeled Seafood. *Food Control*, 28, 74-82.

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