



Native Hawaiian Complementary Feeding Practices as Told by Grandparents: A Transgenerational Experience

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ABSTRACT

Background: Infancy is a significant disease prevention and health promotion stage in life. There is a need to examine factors influencing complementary feeding among Native Hawaiians through an indigenous framed lens.

Objectives: To identify Hawaiian complementary feeding practices through in-depth interviews with kūpuna (grandparents) from across the state of Hawai'i.

Methods: The chain-referral-sampling method was used to identify Native Hawaiian kūpuna knowledgeable in Hawaiian complementary feeding practices from across 4 counties in Hawai'i. Interview question topics included sharing about their formative years, infant health, infant feeding, transgenerational knowledge, and opportunities and barriers related to traditional food consumption. Interviews were recorded and then transcribed. Three coders used NVivo12 to code transcripts using a priori and emergent themes. Institutional Review Board approval was received prior to data collection.

Results: Fourteen kūpuna interviews were included in the analysis. A majority of the kūpuna were female. Most kūpuna shared that complementary feeding practices in their childhood and when their children and grandchildren were being raised reflected aspects of the traditional Hawaiian diet. Poi, or steamed mashed taro root, was the most common traditional Hawaiian dietary staple of infancy. However, kūpuna shared that traditional dietary practices evolved to reflect contemporary dietary practices such as the mixing of poi with infant cereal or milk. Female family members were prominent influences on kūpuna complementary feeding practices. Lifestyle and lack of knowledge were the most commonly shared reflections by kūpuna on the supports and barriers, respectively, to promoting and engaging in traditional Hawaiian complementary feeding practices.

Conclusions: Complementary feeding practices have evolved over generations but aspects of traditional Hawaiian feeding practices have remained. These findings are important when working with Hawaiian families because kūpuna play a prominent role in feeding infants. *Curr Dev Nutr* 2021;5:nzaa086.

Keywords: Native Hawaiian, infant, grandparent, complementary feeding, in-depth interviews

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Introduction

Complementary feeding refers to the stage during infancy when other foods and liquids are needed in addition to human milk (or formula) to meet nutritional requirements (1). Recommendations are to introduce a diversity of complementary foods that are rich in energy, protein, and micronutrients at 6 mo of age (1). Infants develop the motor skill and gastrointestinal function to accommodate the introduction of other foods in addition to human milk or infant formula at ~6 mo (1). Global guidelines emphasize culturally based feeding practices with the

use of indigenous-based first foods (e.g., basic local staple) (2). Culturally based or traditional foods can be defined as foods that originate from local plant or animal resources through gathering or harvesting, and that possess cultural meaning as a traditional food (3).

The indigenous people of Hawai'i are Native Hawaiians. The traditional foods of Native Hawaiians included kalo (taro), 'uala (sweet potato), 'ulu (breadfruit), various greens and fruits, limu (seaweed), i'a (fish), and moa (chicken) (4), which are all nutrient-dense foods. Previous research demonstrated that a traditional Hawaiian diet resulted in weight loss and reduced serum cholesterol and blood pressure in adults

(4). When specifically examining traditional Hawaiian complementary feeding practices, infants were fed a small introduction of mashed 'uala at ~4 mo, followed by the introduction of poi (steamed mashed taro) and other nutrient-dense foods like mashed kukui nuts, sauces made with opihi (limpet) and 'a'ama (crab), vegetables, and herbs starting at 6 mo of age (5).

Complementary feeding practices shape children's long-term eating and health behaviors as well as convey cultural and familial beliefs, attitudes, and practices related to food (1, 6). There are many external influences on complementary feeding practices, which include personal beliefs, family, socioeconomic status, and culture (6). For Native Hawaiians, their intergenerational and cultural influences, household, environmental and social aspects of their community, spiritual beliefs, significant family events, and personal eating philosophy all contribute toward what and how they eat (7). Hawaiian foods reflect positive cultural and social qualities because it is believed that traditional foods carry mana (power), providing strength and health, and are an outcome of a reciprocal relationship between people and land (5). Re-establishing healthy, traditionally based, complementary feeding behaviors for Hawaiians early in life could be one approach to prevent chronic diseases and obesity later in life (6, 8, 9). Previous ethnographic study of Native Hawaiian mothers found that increasing value of traditional practices in the context of current influences might improve breastfeeding rates and decrease the risk of chronic disease and obesity (10).

Not unlike other indigenous communities, the effects of colonization have had significant impacts on the health of the Native Hawaiian community. After their arrival to the Hawaiian Islands, Europeans introduced various infectious diseases that decimated the Native Hawaiian population (11). Native Hawaiians now have the shortest life expectancy (12), and suffer disproportionately from chronic disease and obesity compared with other ethnic groups in Hawai'i (13). Prevention is a recommended strategy for addressing obesity and noncommunicable disease, and starts with nutrition in the first 1000 d of life (1, 14). Complementary feeding practices, including the type and timing, are linked with growth and risk of obesity, chronic disease, and other health conditions later in life (1). There is evidence suggesting that high energy and protein intake in infants increases risk of a higher BMI in childhood (1). In infants, nationally representative data suggest that there is a low consumption of fruits and vegetables and that consumption of sugar-sweetened beverages increases with age (15). The last assessment of complementary feeding practices in Hawai'i (1995) found that Native Hawaiian mothers were least likely to meet timing recommendations for the introduction of foods (16), which is not unlike current national trends (15) or what has been documented in the Asia Pacific region (17).

Complementary feeding practices that fail to align with recommendations put infants at greater risk of excess growth and obesity (1). Examining complementary feeding practices in Native Hawaiians is important because recent trend data from the Supplemental Program for Women, Infants, and Children (WIC) found that Native Hawaiian and/or Pacific Islander infants had the highest proportion (23.9%) of infants with weight-for-length >90% compared with the other race/ethnic groups participating in WIC (18). In addition, data from Hawai'i WIC found Native Hawaiian children aged 2–4 y were significantly more likely to be ≥95th percentile for BMI compared with white children of the same age (19). Finally, data from the largest federally qualified com-

munity health center in Hawai'i, of which a majority of patients were Native Hawaiian, found children who underwent rapid growth between 12 and 23 mo (48%) were at the highest risk of child obesity by age 4–5 y compared with those children who did not undergo rapid growth (19%) (20). Given these statistics, further study is warranted related to complementary feeding practices in Native Hawaiians.

Infancy is a significant disease prevention and health promotion stage in life and calls have been made in the Native Hawaiian community to conduct research to examine factors influencing nutrition behaviors and attitudes among Native Hawaiians through an indigenous lens. More information needs to be gathered related to complementary feeding practices specific to Native Hawaiians. Grandparents, or kūpuna (kupuna is singular and kūpuna is plural), play significant roles in the Native Hawaiian family unit. In Hawai'i, older adults who live with a grandchild are more likely to be Native Hawaiian (21). Native Hawaiians honor their kūpuna, *I ulu no ka lala i ke kumu* (the branches grow because of the trunk), because their knowledge, traditions, and practices are passed on to their future through them. The Pili-nāhā (4 Connections) Framework outlines that for people to feel whole and healthy they need connection to place, community, past and future, and to their better self (22); engaging with kūpuna represents a way in which to establish that connection. Therefore, this research sought to identify Hawaiian complementary feeding practices through in-depth interviews with kūpuna from across the state of Hawai'i. Exploring traditionally based Hawaiian complementary feeding practices might allow for an opportunity to inform culturally based programming for Native Hawaiian families.

Methods

Potential kūpuna knowledgeable in Hawaiian complementary feeding practices for the in-depth interviews were recruited through key informants identified in 4 counties in Hawai'i consisting of Honolulu County (the island of O'ahu), the County of Hawai'i (the island of Hawai'i), Maui County (the islands of Maui, Moloka'i, and Lāna'i), and Kaua'i County (the islands of Kaua'i and Ni'ihau) through the social and professional networks of the research team. Counties were chosen because they represent the various islands of Hawai'i taking into account the smaller islands that are less populated. The research team was composed of 2 Native Hawaiian faculty members (Nutrition and Nursing/Public Health) at the University of Hawai'i at Mānoa. The team also included 1 Native Hawaiian undergraduate student (Dietetics) and 2 Native Hawaiian graduate students (Hawaiian Studies and Nutrition). All research team members were lifelong residents of Hawai'i. Kūpuna eligible for the in-depth interviews included those who were Native Hawaiian, had ≥1 grandchild, and resided in 1 of the 4 counties. The chain-referral-sampling method (23) was then used to identify additional kūpuna. Interviews were conducted between March 2018 and September 2019. The interviews were stopped when the themes that were emerging were being repeated by the kupuna, thereby reaching saturation. Additionally, at that time, the referral chain had stopped and there were no additional referrals from those interviewed. This study was designated with exempt status by the Institutional Review Board (IRB) of the University of Hawai'i prior to the study due to its minimal risk to participants.

TABLE 1 In-depth interview questions on traditional Hawaiian complementary feeding practices

Tell me about your childhood

- Where did you grow up?
- Who raised you?
- What were some cherished memories from your childhood?

Tell me about what you ate growing up

- What does a healthy baby look like to you?
- How do you know if a baby is sick?

When we talk about feeding think about the first foods that you fed babies in addition to breastmilk or formula. How did you learn about what to feed babies?

- Who were your kumu (teachers)?
- What were your kumu's (teachers') skills?
- Where were they from?

What did you feed your baby(ies)?

- How was your baby's(ies') food prepared?
- Who prepared your baby's(ies') food?
- Where did you get your baby's(ies') food?

Who did you go to for advice about feeding your baby(ies)?

- Did you go to a doctor?
- If someone gave you advice would you follow it?
- Were roles determined by age or gender?

When did you feed babies something other than breastmilk or formula?

- What types of food and drinks did you introduce?
- How were the foods and drinks given?
- Was this different from what you were told to do?

What are your earliest recollections about how baby(ies) were fed in your family?

- What were the roles of other family members in feeding the baby?

What ways of feeding babies have remained among your children? Grandchildren?

- In your family, how has the feeding of babies changed over time from your generation to the next?

Through your life experiences how has your perception of feeding babies changed?

- What in our community supports parents in serving traditional Hawaiian foods to their babies?
- What makes it difficult for parents who want to serve traditional Hawaiian foods to their babies?

An interview guide was developed using the social ecological model (24) and informed by a literature review on complementary and Hawaiian feeding practices. General topics covered child formative years, infant health, infant feeding, transgenerational knowledge, and opportunities and barriers related to traditional food consumption. Specific questions can be viewed in [Table 1](#). The interview guide was piloted with 2 kūpuna and adjusted accordingly based on their feedback prior to conducting the study.

Interviews were arranged to be conducted location of the kupuna choosing and included consent to participate prior to conducting the interview. Permission was granted by the kupuna to audio and/or video record the interview for subsequent review, editing, and analysis as well as to archive in the library at the University of Hawai'i at Mānoa. The research team also provided a copies of the video and/or audio recordings to the kūpuna to share with their families. At the onset of the in-depth interview basic demographic information was collected including year of birth, sex, and number of children and grandchildren. Samples of various traditional Hawaiian foods were available at the interview to honor the kūpuna and stimulate discussion of traditional foods. At the end of the interview the kūpuna were compensated with a \$20 gift card for their time. Audio recordings were transcribed then reviewed for accuracy by 1 member of the research team.

Transcriptions were loaded into NVivo 12 Plus (QSR International) for coding, text retrieval, and content analysis. An initial set of a priori themes were developed based on previous literature and then emer-

gent themes were identified through the analysis process. To ensure interrater reliability, 3 interview transcripts were selected at random and 3 members of the research team independently coded the transcripts based on an agreed code book using the a priori themes. Three rounds of independent coding were done, with discussion occurring after each round to update the codebook with emergent themes, until a mean Cohen κ of 0.79 was achieved, which is considered a moderate level of agreement (25). The remaining interviews were then independently coded by 2 researchers. One researcher independently coded all of the remaining interviews while 2 researchers divided the remaining in half and independently coded those interviews using the same codebook. The 3 researchers then examined the themes and merged similar ones into agreed higher-order themes, which became the final set of themes. The 3 researchers then agreed upon final themes and summarized the results. Validity was ensured using 2 strategies: use of a shared codebook that had operationalized definitions of themes, and through discussion and debate of main themes identified between the 3 researchers. Verbatim quotes were used to provide examples of the identified themes.

Results

Fourteen kūpuna participated in the study. Kūpuna were either raised in or currently resided in Honolulu, Kaua'i, and Maui County. A majority

TABLE 2 Descriptive characteristics of kūpuna participating in in-depth interviews on traditional Hawaiian complementary feeding practices

Variables	Values
Range of years in which kūpuna were born	1936–1961
Mean age (SD), y	66 (8.8)
Number of kūpuna who were female	10
Range in number of grandchildren	2–27
Range in number of great grandchildren	1–13
County the kūpuna currently resides in	
Hawai'i ¹	0
Honolulu ²	8
Kaua'i ³	0
Maui ⁴	6
County the kūpuna were raised in	
Hawai'i ¹	0
Honolulu ²	6
Kaua'i ³	1
Maui ⁴	5
Multiple locations ⁵	2

¹Hawai'i County is the island of Hawai'i.

²Honolulu County is the island of O'ahu.

³Kaua'i County includes the islands of Kaua'i and Ni'ihau.

⁴Maui County includes the islands of Lāna'i, Maui, and Moloka'i.

⁵Includes time on the contiguous US mainland.

of the kūpuna were female. One interview was conducted with a pair of kūpuna, 1 non-Native Hawaiian kupuna and 1 Native Hawaiian kupuna. The research team wanted to honor the kūpunas' wishes and conducted the interview but did not include the non-Native Hawaiian kupuna in the analysis. Separate interviews were conducted with 1 father-daughter and 1 husband-wife pair. Further details on the kūpuna are outlined in [Table 2](#).

Overall findings of the interviews are presented thematically by childhood experiences, participant role as a parent in feeding their keiki (children), participant role as a grandparent in feeding their mo'opuna (grandchildren), and reflections on the supports and barriers to promoting and consuming a traditional Hawaiian diet starting in infancy. [Tables 3–7](#) detail the themes and subthemes, if applicable, that fall under each respective category and were discussed by ≥ 4 kūpuna. Verbatim quotes were selected that illustrated the perspective of the kūpuna in relation to the theme or subtheme, if applicable.

Their childhood experience

[Table 3](#) describes the childhood experiences of the kūpuna. Half of the kūpuna moved around when growing up, meaning either that they were born in the contiguous US mainland and then moved to Hawai'i as children, moved back and forth between the contiguous US mainland and Hawai'i as children, or moved between the different Hawaiian islands. Another influential aspect of their lives was the family dynamic. The family dynamic included living with extended family, having a large family, or a family that followed tradition and/or cultural practices. Some kūpuna discussed that they were raised primarily by their grandparents or great-grandparents. Other kūpuna mentioned that they were raised primarily by their parents. Regardless, the kūpuna shared that these experiences influenced their decision making when feeding their own children. Of the kūpuna who shared this, the marital status of their parents influenced the foods that they ate because they depended on

where they were living with their parent(s). Most of the kūpuna shared that they ate a traditional Hawaiian diet when growing up. The 1 aspect of the diet that was discussed the most frequently was the consumption of poi. Kūpuna reported that poi was either delivered to their homes or was always present in a bowl on their tables. Although poi was not consumed on a regular basis by all, the kūpuna often commented on it being more readily available. Those kūpuna who lived on the contiguous US mainland shared having poi shipped to their families or having poi available in a powdered form. Many kūpuna also shared that their childhood diet consisted of homemade/table foods, fruits and vegetables, and processed foods, which included canned or frozen foods. Women and mothers played a prominent role in feeding infants; however, there was mention of the role that men (i.e., uncles, grandpas) had with cooking.

Feeding their keiki (children)

[Table 4](#) describes the approach that the kūpuna took with feeding their keiki. Many of the kūpuna indicated that they learned how to feed infants from their family, followed by being self-taught (i.e., reading books). In regard to the timing of when a complementary food was introduced, responses clustered between when the child was developmentally ready to when the child turned 6 mo. More than half of the kūpuna shared that they fed their children a traditional Hawaiian diet, with poi often mentioned as the most frequently indicated first food for infants. Kūpuna also shared how they fed their children a more contemporary Hawaiian diet. A contemporary Hawaiian diet was defined as traditional Hawaiian foods being mixed with contemporary foods, or traditional Hawaiian food preparations being applied to contemporary foods. Examples of contemporary Hawaiian diet practices shared by the kūpuna included mixing poi with sugar, milk (all types including human milk), or rice cereal. It was also very common as these kūpuna were reflecting on complementary feeding practices to share the place that human milk had in their children's diet. In terms of food preparation, kūpuna often mashed the food. The traditional practice of chewing the food prior to feeding the child was also shared often.

Feeding their mo'opuna (grandchildren)

[Table 5](#) presents how the kūpunas' mo'opuna, or grandchildren, were fed. Similarly to their children, a traditional Hawaiian diet was the most commonly reported. From this diet, the item that was most commonly discussed was poi. Additionally, a number of the kūpuna commented that their children and grandchildren would come to them asking for foods, such as lū'au (taro) leaves, or kalo (taro), or other traditional foods that only they would make. Kūpuna also mentioned that their grandchildren ate diets composed of fresh fruits and vegetables; however, both homemade foods and convenient prepackaged foods were also commonly served. A few of the kūpuna mentioned that their daughters-in-law, specifically, encouraged fresh fruits and vegetables and discouraged convenience prepackaged foods.

Supports to a traditional Hawaiian diet for infants

As indicated in [Table 6](#), many of the kūpuna responded that a lifestyle that supports traditional foods is important in the community for families to be able serve their infants a traditional Hawaiian diet. Examples of this include involvement in Hawaiian-focused programs. The increased access to traditional Hawaiian foods was also highlighted by almost half

TABLE 3 Themes and subthemes related to the category childhood experiences with exemplifying verbatim quotes identified through in-depth interviews on traditional Hawaiian complementary feeding practices with kūpuna (n = 14)

Theme	Subtheme	n	Exemplifying quotations
Moved around	None	7	Okay I spent a lot of time moving around throughout my childhood because my father was in the military so both my parents are born and raised here in Hawaii but because my dad was in the Air Force I've had the opportunity to live in a lot of different places. Well, my mom did, and then she got, my mom and dad, and then they got divorced, I don't know what year it was, probably when I was in third grade. They got divorced then after that we kinda stayed. Then she remarried again so we stayed up in Kula, for a while then we came back down to Waihe'e for a while. And then I stayed with my grandfather for a while 'cause my stepfather and my mom didn't get along together so they kind of split up. So I stayed with my grandfather. But most of the time we stayed with my grandfather because we had to, sometimes it was hard for my mom. My grandmother had 18 children, she was a healer master of ho'oponopono [to make right]. My grandfather was a conductor of the Royal Hawaiian Band. When he retired they moved to Moloka'i with their 18 children, so her belief was that first child belongs to her. So out of all the families I grew up with 9 other boys. I was the youngest and the only girl. I was quite spoiled by my grandfather, who was very adamant about everyone learning to play an instrument. Our land quarter flowers, quarter la'au [plants]. I grew up by the ocean in Kalama'ula, so I was in that water all the time. So when we talk about food and being young. My grandmother came to get me 2 days after I was born. My father was in the military, my mother was pregnant as they were traveling back from Germany, landed at Fort Hamilton Kentucky, and I was born. So my grandmother came to get me and I grew up on the island of Moloka'i. We were living among family all the time; we were living next door to family, living by the beach. Staying with my grandpa was better than moving around. He got to teach us more than my parents did. So, I learned a lot from my grandparents.
Raised by	Grandparents	5	I grew up here, well, we moved here when I was 5 years old and I come from a family of nine. And my grandparents lived here also, and my parents took care of us yeah.
Ate growing up	Parents	4	So my mom my dad and my 3 younger brothers was pretty much our family.
	Traditional Hawaiian diet	12	And there were these bowls always on the table, always there were bowls on the table. And I had poi, I had pa'akai, or sea salt. One had canned salmon, 1 might have dried aku [skipjack tuna]. Poi was very available and the poi man came to the house in his truck. Yes, there was an abundance of poi when I was growing up. Would bring around poi on Fridays and we would run out with our order. But it was pa'i 'ai [hard, pounded but undiluted taro] so pa'i 'ai lasted for quite a while and made a lot of servings, so it was very inexpensive. My dad used to go diving, fishing, so we had 'opihī [limpet], lobster, fish, turtle. Yeah. My dad used to hunt, too. Off of the land. I remember mom and dad would eat out of big bowl while we had our little [bowl] because that way we won't make the bowl messy. Because another thing that I remember that mom and dad used to do, especially dad, was wet his finger and scrape the sides so that the poi around actually the bowl, the lining, was clean and the all the poi sat by itself independent of the sides of the bowl. Grew cabbage, beets, and those things that, because it was more like stretch a can of corned beef you know to stretch so that you could feed everybody like that, so it was growing the vegetables that you could add to a can of corned beef that you could stretch, so that's how it was. I can tell you that my mother did that thing that nutritionist talk about today. She made sure that every plate had all different colors on it right so like a salad if I made a salad she'd say that's a boring salad right because it was all green or green and white. So I'd have to put tomatoes. I have to put the green onions even though as a child I didn't really like the onions. I'd have to put the green onions in there because it added color so that was like a requirement ... so I think I ate a really well-rounded diet that always had at least 2 vegetables and fruit and you know starch and meat and all that.

(Continued)

TABLE 3 (Continued)

Theme	Subtheme	n	Exemplifying quotations
Ate growing up	Homemade and table foods	11	<p>So pretty much a lot of the stuffs that we ate came from the ocean as well as the 'aina [land] that we had. So when you're talking about bananas, when you're talking about, we had mango trees, we had lychee trees, we had papaya trees, we had all of this on our land, so every morning as far back. So when I saw your questions I thought o.k. Let's go back memory lane how far back can I remember? And I can go back really strong when I was 4 years old, my grandmother was very adamant that everyone ate together as many meals, definitely breakfast definitely dinner. For breakfast always had papaya, poi was on the table. I know that fruits were a big component of that.</p> <p>I ate everything because we didn't have any choice.</p> <p>When you have a big family you going to be eating a lot of stews. A lot more than pork chop, hamburger. We didn't eat hamburger. We didn't grow up with hamburger. I came to this island [O'ahu] at ninth grade and it was like a big candy store for me. We didn't eat those things. We ate a lot of leftovers. If we ate stew the night before we were eating that for lunch time if we are not in school. As much as my grandmother worked and she use to see people at the house. Our dinners were never later than 5:30/6pm. She would have things on the stove. Back then no more pressure cooker. Everything handmade.</p> <p>My dad was this amazing cook. So my dad spent a lot of time in the kitchen and my dad would like literally so when they catch fish he would bottle 'em too put 'em in oil and the thing would sit in the cupboard right so we'd always have bottles of fish inside cupboard. I forget what it's called but I remember right above the stove open the cabinet you gonna find bottles of fish in oil and I don't know what to preserve the fish something like that, always cook with you know. My dad always tried new things to cook yeah so he did a lot of that.</p>
Ate growing up	Processed foods (including canned and frozen)	8	<p>More canned goods.</p> <p>Back then it was luncheon meat, you know the big can, everyone shares the can, it was, it's not like today where you can have two or three sandwiches. It was like 1 sandwich.</p> <p>But yeah, it was a different kind of time. During the war years I know we had to have our own food, like I mentioned, so my sister really wasn't introduced too much besides the Pabulum. From outside, we had canned fruit. There was no frozen food. We had canned fruit.</p> <p>So like pork and bean, hot dog was like our favorite right growing up. I would eat that today yeah. Red hot dog, no can be the other color hot dog. When they were discovered my grandpa said like where that brown thing came from that not hotdog he would freak out and he would want that kind of hot dog, but it was always Redondo red hot dog we had. I don't remember having too much Vienna sausage like eating it I don't know why. But you know tuna is the norm, corned beef in a can yeah so corned beef and onion was dinner, pork and beans and hotdog was dinna. My grandma would buy Devil's ham, the small can also commissioned, only 1 dinner for whatever Devils ham was and just eat 'em with cracker. Yeah so lots of cracka you know the saloon pilot cracka, soda cracka, coffee, coco. Coco was the night time snack where you bust out all the crackas inside put the butter inside and with my tutu [grandparent] it was coffee and rice. Leftover rice in the morning she'll put the pour 'em in the coffee and that was I eat 'em with her but I don't drink coffee. You know that is so strange but that was something I remember always having with her in the morning, yeah coffee and rice. Yeah so yeah it was but it wasn't extravagant food it was simple, always made. Had to have had eggs in the ice box you know milk, dry cereal at the minimum wasn't something we always had mush, oatmeal was always there so that was always good with bread and butter yeah and I dip you know you dip 'em inside. Coco and bread and we used to eat lots of bread yeah.</p>

(Continued)

TABLE 3 (Continued)

Theme	Subtheme	n	Exemplifying quotations
Ate growing up	Contemporary Hawaiian diet	7	We would get powdered poi you know it would be mailed to us right and then that's how we would make poi at home. Throughout the year your relatives send you the powder packets powder poi or in those days they you could freeze it and then there's nothing worse than frozen poi. I have this creativity, because we get fresh poi. That's the best time to eat it with sugar and milk. That's all we ate, that's our cereal.
	Food security	5	But we all fast eaters you know we grew up like that and it wasn't because never had enough food it was always because we were busy. It wasn't, it had nothing to do with we never had enough food we always had more than enough food. Our cupboards were never empty, our icebox was always full, our house was the place everybody brought food to.
Who fed you?	Mothers	7	Moms. Mostly the moms because the dads work. If you know what my dad was the cook in our house. For feeding the baby was my mom.
	Women	6	Actually it was our grandparents, my mom. It's all the women who are caring for babies. I mean men were in our lives but the women were the caregivers.
	Men	5	So, really it was the wāhine [women] who took care of the baby. The wāhine who like fed the baby. You know we ate a lot of fish ... steamed fish and my grandpa was a great cook, too so you know but he would cook with a lot of vegetables. Because he was the cook in the house so that's how I learned how to cook by watching my dad. So when I was 5 already I started. So all this learning process.

of the kūpuna. Different educational programs were also highlighted as being supportive of families to providing traditional foods to their infants.

Barriers to a traditional Hawaiian diet for infants

Half of the kūpuna discussed lack of knowledge due to not being exposed as a barrier to serving traditional Hawaiian foods (see Table 7). This was followed by the indication that there is not enough access. Access was framed in regard to families having their own 'āina, or land, to grow their own, or access to farmers who grow traditional Hawaiian foods. The lack of integration in the educational system and the busy lives that families lead were also discussed by a number of kūpuna.

Discussion

This study summarizes the complementary feeding practices used during the kūpuna's upbringing in addition to the upbringing of their children and their grandchildren. Most kūpuna shared aspects of the traditional Hawaiian diet, with poi being the most common staple, reflected in the complementary feeding practices used in their families. In addition, family, especially female family members, were prominent influences on complementary feeding practices. Understanding the role of Native Hawaiian kūpuna in the diet of infants is important because a review of the evidence in non-Native Hawaiian families suggests that grandparents' feeding attitudes and behaviors can negatively influence the dietary intake and weight status of their grandchildren aged 2–12 y, especially when it is in conflict with parents and if grandparents possess a caregiving role (26).

This study identified 1 particular traditional food item, poi, as being an important complementary food. Poi is suitable for complementary food introduction because it is nutrient dense (high in carbohydrates and minerals, especially potassium, magnesium, and calcium), hypoallergenic, and easily modified to a semiliquid texture (27–31). However, the contemporary modifications of the traditional Hawaiian diet occurring across generations were interesting to observe. Kūpuna reported mixing poi with different ingredients, such as sugar. These adjustments for taste will also impact the foods' nutrient profiles. In addition, another interesting practice discussed was the mixing of poi in a bottle. This practice of adding food items to a bottle has been identified in other cultures (32). The reasons for this practice documented in another study were that grandmothers and mothers believed it assisted with satiation and encouraged better sleep (33). These findings could be of particular importance to future studies related to complementary feeding practices in Native Hawaiian families because they acknowledge that certain traditional foods such as poi continue to be of value but the modes in which they are consumed might negatively influence nutrient profile and health outcomes.

The transitions noted in the Hawaiian infant feeding practices could have been the result of the direct or indirect cultural and historical trauma. At one time it was illegal to practice the Hawaiian culture and perpetuate the language (11). This was further compounded by the loss of land, which resulted in a fractured food system where Native Hawaiians were unable to cultivate their traditional foods (34). The decline in the traditional food system and the lack of food sovereignty (35)

TABLE 4 Themes and subthemes related to the category feeding their keiki (children) with exemplifying verbatim quotes identified through in-depth interviews on traditional Hawaiian complementary feeding practices with kūpuna (n = 14)

Theme	Subtheme	n	Exemplifying quotations
Who taught you how to feed	Family	10	My mom, my mom and my grandmother. And then [NAME], my wife, and her mom. Help us. Mostly my mother. I would say my grandmother, my auntie, my uncle, as so many people surrounded us, especially when my parents divorced. I must say that I was very fortunate that many took me under their wings who I didn't even know and I got to know. And I think that's why there's such an affinity for kūpuna because they shared, sometimes just the observations of what they did. So, how did I learn? It was observation for what my grandmother would do for all of us, and then sometimes just telling us, "Go get this, go get that," and those memories stick with you of why they applied certain foods at certain ages. I read the books and it was like breastfeed until you're 6 months. Oh I'm like okay 6 months, wow, and then you know I paid a little bit more attention to written guidelines with my younger one. I read a lot before I, we, didn't have our, my husband and I, didn't have our kids til we were in our thirties. Not by choice, it's just that what happened. We were married 10 years before we had our first. So I was little bit more mature. I read a lot.
		8	I decided on my own I wasn't feeding them anything except breast milk until they were 6 months. No, yeah the 6 months, that's when we started feeding them. Oh, you give them small kind of portions and then breastfeed. Yeah my girls was always breastfed, not milk in a bottle So I actually fed my daughter poi a little bit earlier and it was because I was looking for cues of her eyes visually following our food. If we had the spoon coming to our mouth her moving for it. So I was looking for her physical readiness instead of just a number in the book. Well, you should feed your baby at the age your baby tells you it can be fed. But I do know the importance of the poi. The poi was very important to us. If we didn't have anything else we had the poi. That was at every meal no matter what we were eating. Well, back then, I wasn't too much of an 'āina [land] person but, we did get some. I used to dive a lot. Used to have a lot, a lot of fish and takos [octopus]. Back then I think we used to buy our poi. Everything was watered down. I would take the soups, whether it be a lū'au [taro tops] stew of some sort, never beef stews not that kinds of stews. I did a lot of kalamungay [small leaf bushed tree] because it's so high in nutrients. So is our lū'au but it is harsher for the baby. So I would use that leaf to make that soup that I am able to pour over poi that is already watered down which I knew was going to be good for them.
		5	The vegetables. My daughter pretty much liked anything that was green so whether it was beans, peas, spinach. Spinach was her favorite, which was the prelude to her declaring at age 15 that she was going to be a vegetarian right I should have known that because she really loved anything that was green. And one of uh the things I recall that we fed my son when he was born, and he was the first child, grandchild, and my mother introduced it to him and he loved it, was cooked banana. We don't have it on the market anymore. It used to be available at all the supermarkets. It was um smaller than the usual banana, usually, and it was oh, it was so sweet. It was like dessert almost if you tasted it. My son absolutely loved, so you know it tasted sweet to them too. But it was very yellow. Very, very yellow, almost a rich yellow, so it almost orange, not quite orange. But when you steamed it, you had to steam it to eat it. It was one of the cooking bananas that was steamed. And you steamed it whole and then peeled back the banana. My mother used to feed it right from the banana peel. She would take off the peels, slice down and take off a whack of it and then feed it to the baby. And oh, my son just loved that, and I fed it to my daughter as well. And I'm sure that it has, because of its color, would have some vitamin A and a little bit of C as well.
When to feed	6 Months		
When to feed	Developmentally ready	6	
What was fed	Traditional Hawaiian diet	9	
What was fed	Fruits and vegetables	8	

(Continued)

TABLE 4 (Continued)

Theme	Subtheme	n	Exemplifying quotations
What was fed	Contemporary Hawaiian diet	8	<p>Some of it might be fruits, as simple as fruits. Going in the backyard, go get some fruits, and being able to mash those up. And so as babies, I remember, instead of just Gerber's oatmeal or whatever, it might be some of the fresh vegetable or fresh fruits that would be mashed up and mixed together, and that would be spoon fed.</p> <p>The other way was poi. Poi was very common to be fed to the babies, and I love it because it was used in so many ways, whether it was in the bottle with milk. Sometimes as pudding or liquefied with some sugar mixed in it so that the baby would take it. It was one of the first staples that they could eat when it was that time to move it from the bottle to more of a beginning solid food.</p> <p>Poi. Absolutely, absolutely that was the first one and see 1 of my grandmother's said you have to feed it with the babies with milk and sugar right because that's what they did but my family we ate poi with shoyu [soy sauce], which I thought was normal but I've since learned that nobody else eats it with shoyu. I think only my family. Yeah but poi I think that was well I used to mix poi and the cereal and poi and the fruit in poi.</p> <p>Mom made a bottle of poi and milk with a little bit of sugar in a baby bottle and [NAME], my wife, I thought she was gonna lose it and I tried to just explain to [NAME], no that's fine. There nothing wrong with poi. It's good for [NAME] and da da da da you know. Cause mom kept thinking that [NAME] was too pale and she needs to get dark. You know give her poi and this and that and I'm like you know what, anyway.</p> <p>So I think 'cause I was a younger mother at that time that I decided well you know I'm going to breastfeed him and I just breastfed him. I feel like my mom breastfed my brothers. That's 1 thing I do remember, my mom breastfeeding my brothers.</p> <p>I breastfed for 13 months which today is not that long but at that time it was it was pretty significant that I had breastfed. Most of my friends at that time who were having babies if they breastfed at all, you know if they didn't give up after the initial try, they didn't do it for more than maybe 3 months.</p> <p>When I started having my own babies. I knew already that my babies were going to tell me when it's time to eat. Bottles are good. Breastfeeding is better. No more bottles. That baby is right there all the time. It is much more lighter in fluid and substance. We know that it is your best vitamin. It prevents them from getting sick. We know that from research today.</p> <p>I gave them some Gerber's. One of my favorites was banana tapioca pudding, and I used to love just to eat that by itself. Just as 1 of my little dessert items. So the girls got those kinds of foods.</p> <p>The jars sometimes and then the, oh gosh, what was that pouch thing? You add water to it, and milk. Yeah I remember making that cream stuff, and feeding the kids.</p> <p>I joined the hamburger helper, tuna helper, kind of hamburger curry stew with frozen vegetables, right. Everything cream of mushroom, everything canned, pork chops in cream of mushroom, hamburger in cream of mushroom. Chopped up chicken in cream of mushroom. And so like, the really big like oh my God this like is a special day coming down was rice balls with ume [salted Japanese plum] in the middle and KFC. Like when the elders came home with a bucket of KFC, you know there's some good news happening right. But otherwise everything we did yeah was on the cheap.</p> <p>Whatever we were eating was what the baby going to eat unless they was drinking bottle you know but I don't remember baby food in the bottle.</p> <p>And you know I was of the philosophy the kids have to adapt to me, I'm not adapting to them. So if I'm gonna eat raw crab, they're gonna eat raw crab. You know I mean if that's what we having for dinner that's what you gonna eat so as long it didn't, you know, as long as it age appropriate.</p> <p>I guess my mother introduced poi for the first time to [NAME]. She was the one that gave it first. I know I was very upset because feeding recommendations were to withhold solids and she, my mother, said to me, you know, Hawaiians gave babies things to eat like poi earlier.</p>
What was fed	Processed and frozen foods	6	<p>I joined the hamburger helper, tuna helper, kind of hamburger curry stew with frozen vegetables, right. Everything cream of mushroom, everything canned, pork chops in cream of mushroom, hamburger in cream of mushroom. Chopped up chicken in cream of mushroom. And so like, the really big like oh my God this like is a special day coming down was rice balls with ume [salted Japanese plum] in the middle and KFC. Like when the elders came home with a bucket of KFC, you know there's some good news happening right. But otherwise everything we did yeah was on the cheap.</p> <p>Whatever we were eating was what the baby going to eat unless they was drinking bottle you know but I don't remember baby food in the bottle.</p> <p>And you know I was of the philosophy the kids have to adapt to me, I'm not adapting to them. So if I'm gonna eat raw crab, they're gonna eat raw crab. You know I mean if that's what we having for dinner that's what you gonna eat so as long it didn't, you know, as long as it age appropriate.</p> <p>I guess my mother introduced poi for the first time to [NAME]. She was the one that gave it first. I know I was very upset because feeding recommendations were to withhold solids and she, my mother, said to me, you know, Hawaiians gave babies things to eat like poi earlier.</p>
What was fed	Table foods	6	<p>I joined the hamburger helper, tuna helper, kind of hamburger curry stew with frozen vegetables, right. Everything cream of mushroom, everything canned, pork chops in cream of mushroom, hamburger in cream of mushroom. Chopped up chicken in cream of mushroom. And so like, the really big like oh my God this like is a special day coming down was rice balls with ume [salted Japanese plum] in the middle and KFC. Like when the elders came home with a bucket of KFC, you know there's some good news happening right. But otherwise everything we did yeah was on the cheap.</p> <p>Whatever we were eating was what the baby going to eat unless they was drinking bottle you know but I don't remember baby food in the bottle.</p> <p>And you know I was of the philosophy the kids have to adapt to me, I'm not adapting to them. So if I'm gonna eat raw crab, they're gonna eat raw crab. You know I mean if that's what we having for dinner that's what you gonna eat so as long it didn't, you know, as long as it age appropriate.</p> <p>I guess my mother introduced poi for the first time to [NAME]. She was the one that gave it first. I know I was very upset because feeding recommendations were to withhold solids and she, my mother, said to me, you know, Hawaiians gave babies things to eat like poi earlier.</p>
What was fed	Poi as the first food	6	<p>I joined the hamburger helper, tuna helper, kind of hamburger curry stew with frozen vegetables, right. Everything cream of mushroom, everything canned, pork chops in cream of mushroom, hamburger in cream of mushroom. Chopped up chicken in cream of mushroom. And so like, the really big like oh my God this like is a special day coming down was rice balls with ume [salted Japanese plum] in the middle and KFC. Like when the elders came home with a bucket of KFC, you know there's some good news happening right. But otherwise everything we did yeah was on the cheap.</p> <p>Whatever we were eating was what the baby going to eat unless they was drinking bottle you know but I don't remember baby food in the bottle.</p> <p>And you know I was of the philosophy the kids have to adapt to me, I'm not adapting to them. So if I'm gonna eat raw crab, they're gonna eat raw crab. You know I mean if that's what we having for dinner that's what you gonna eat so as long it didn't, you know, as long as it age appropriate.</p> <p>I guess my mother introduced poi for the first time to [NAME]. She was the one that gave it first. I know I was very upset because feeding recommendations were to withhold solids and she, my mother, said to me, you know, Hawaiians gave babies things to eat like poi earlier.</p>

(Continued)

TABLE 4 (Continued)

Theme	Subtheme	n	Exemplifying quotations
	Cereal	5	I remember even when he was younger, that poi was going to be the first food. I'd cereal. Rice cereal I started at 9 months. With the milk, yeah. I did feed him some rice cereal, which I didn't do with my second child. Carnation milk. After breast feeding.
	Milk	5	I went after 1 year to regular milk with my son. I think I just went to regular with milk with my daughter. I was a little bit more aware of it being organic milk.
Food preparation	Mashed	7	I started introducing, before I knew about baby foods in the store, the smashing of the papaya, the banana, guava. Guava was great to use on baby when they had the runs. Not the guava juice the guava itself. It was great. Always just mashed the food. We didn't have food grinders. We didn't have blenders. We didn't have any of the stuff.
	Chewed	6	I guess from my grandma, my grandma, I don't think we had baby food back then, it was always fish, and poi, and tako [octopus] but they used to chew the food before they gave it to us. But we still do that, we still do that up until now. Well, I guess it was passed down from generations, that's how they would soften up the food for the kids, because way back, they never had the formulas in the bottles, they never did have, so they always used to chew them up and give them to the kids. The process of an adult chewing for the baby is a good one and mom chewed the meat to make it soft for [NAME] to chew on and I looked at my wife and she was really biting her tongue. She didn't like it she thought it was unhygienic, trying to use the right words here, and I told her and explain to her no that's the custom that we do. A lot of adults will do that because they consider the mouth as a like a sacred you know it's nothing, it's not garbage in other words. Your mouth is not considered unclean whereas you're thinking; you know she's thinking it's unclean. It's the hygiene, you know, you don't do that. Or else my grandmother, my auntie, then would take it and chew it, and then take it out and put it into the baby's mouth. And as I got older, to realize that was a tradition, we say feeding the haumana, feeding the student, feeding the baby. So that was 1 way that I saw when I did for my own daughters. I would chew up the food for them.
Food preparation	Homemade	4	You know I was doing the simple like you know like everybody said you're supposed to do in those days. But my mother boiled apples and she said this is how you make applesauce and I'm like wow you can make applesauce and after that I did that with everything. I made my daughter pears. I did papaya which you don't have to cook. Just every fruit you can imagine and so when I would drop my daughter off at the babysitter I had complete meals all homemade already prepared and dropped off for my daughter.

TABLE 5 Themes related to the category feeding their mo'opuna (grandchildren) with exemplifying verbatim quotes identified through in-depth interviews on traditional Hawaiian complementary feeding practices with kūpuna ($n = 14$)

Theme	<i>n</i>	Exemplifying quotations
Traditional Hawaiian diet	7	Poi was still a main component in raising these babies, and then raising my grand babies. Poi is still a main component of raising these children. So that really is our big staple that never changes and I find that amazing. Now the texture of the poi has changed quite drastically from Kaua'i to Maui to Moloka'i. Quite different. Oh definitely. Because my kids have to work they work they all work. So it's a matter of convenience and time and everything else. They come here. "Dad we need lū'au leaf." "Dad!" "What?" "Get kalo?" They're starting to grow in their own yards, they're starting.
Fruits and vegetables	5	Those kids would go running to choy sum before they would run to a candy bar. With my kids and my grandkids. They always have fruits and vegetables around all the time.
Processed and frozen foods	5	So my grand, my great granddaughter is being raised on more things like that. More boxed macaroni and cheese. But you know these are very hard times for young people to feed a family. I remember my granddaughter once, my son bringing over my granddaughter, and they had tried to like wipe all the Cheetos off of her but you know it's like orange right and it stains and you can smell it. I'm like oh my god did you just, were you just eating Cheetos? She's like yes. And so. And then my youngest granddaughter has a sweet tooth and they keep a lot more junk food around the house.
Table foods	4	Oh, my littlest grand one, I didn't tell you. My little one, I have 1 who is 6 years old. From the very beginning she had to eat what her parents were eating. I don't care what it was, she knew it was food that she wasn't getting, so she wanted. And so she has been eating adult things since she was very little. I didn't think that was such a good idea, but she has not developed any kind of allergies or you know she never choked on anything. Although sometimes she doesn't chew as well as she should and I keep telling her, her stomach is working far too hard. You need to chew it a little bit. But she eats and enjoys it. Adult food, she enjoys adult food. She'll tell me sometimes, "Oh papa buys this stuff and it's a little bit spicy tutu. I don't really like it. I'd much rather have something else and so I have to hunt for something." But she can eat kind of spicy stuff. I've seen her do it, but not so much until she's about 4 or 5 I think she started to branch out to the spicier things. I think because they are still on Maui and because my husband and I are still alive they are eating the same things we are.

resulted in a greater reliance on nontraditional foods. However, the stories shared by the kūpuna confirm the resiliency of traditional foods.

Another Hawaiian practice commonly discussed was the pre-mastication, or chewing, of food for a child. Traditionally, this practice is called

māna, where an adult, commonly a mother or grandmother, would chew the food prior to placing it in the mouth of a child. This practice provided nourishment to the child as well as allowing them to absorb the traits of the individual who prechewed the food. This practice is

TABLE 6 Themes related to the category supports to a traditional Hawaiian diet exemplifying verbatim quotes identified through in-depth interviews on traditional Hawaiian complementary feeding practices with kūpuna ($n = 14$)

Theme	<i>n</i>	Exemplifying quotations
Lifestyle	8	My mo'opuna [grandchildren] are all Kula Kaiapuni [Hawaiian Immersion School] students they're all you know they all go to schools of Hawaiian language immersion schools so they're right in the middle of it and they're in programs ... they know how to ku'i [pound], they you know how to fish, they know how to clean fish. They know how to pound poi, they know how to harvest and plant a garden, and they go right into the kitchen and cook. So, yeah it takes a lot of lived experience, hands on the land. Hands in the kitchen.
Access	6	I think there's just definitely an increase of knowledge and awareness of traditional foods and I can only speak for the Hawaiian culture. You know we have, we do have a lot more poi farmers, we have a lot more access to some of the foods, a lot more awareness of how important, you know. You know, it's nice to have a place where you can just go outside and you can just pick what you like eat. Same thing like my grandkids, you know my grandkids, when I walk down here they look at one tomato, they pick um, they eat um. The kine, they see a ripe banana, "papa, I like this one," eat the banana. You know, we got the mangoes down there that they pick and they eat without asking papa. We all used to do that when we were small.
Education	5	I always thought later on in life as a child, as I was raising my children, we grew up and I had my grandchildren, my grandchildren came along. I always thought that every center should have education on the values or the importance of ethnicity. Ke Ola Mamo [a center in the Native Hawaiian healthcare system] did a very good spread of healthy eating in the Filipino culture, of course the Hawaiian diet, the Chinese culture, the Japanese culture. I thought it was really good how they put it on stands so that we can remember where we came from. Māla'ai [garden] integrated into academics. So I'm trying to teach my mo'opunas how to do that, how to pound poi, how to plant, because they just planted 1 line of kalo [taro], my 2 oldest grandsons and now it's nice and healthy. But they never see yet, when they come, they are gonna be like, wow. And when it's ready they help to harvest, they help clean, and they help pound. So my grandkids can pound their own poi now. It's one of those stuff that grandparents, not all, but you know, just the ones that want to be self-sustainable and the ones that wants to teach their kids how to plant, how to feed themselves. Yup, it's all about the 'āe I, growing your own food, organic.

TABLE 7 Themes related to the category barriers to a traditional Hawaiian diet with exemplifying quotes corrected for grammar identified through in-depth interviews on traditional Hawaiian complementary feeding practices with kūpuna ($n = 14$)

Theme	<i>n</i>	Exemplifying quotations
Lack of knowledge	7	They're local they're you know middle class but they're not talking about. They're not like seeking out poi sources or you know or figure out how to ku'i [pound] at home simply because there hasn't been that same exposure you know that perhaps my family and my daughter's family have created. I think what makes it difficult for them is that, if they're not brought up in it, and they're not educated with it, then they don't know. If they don't have experience in feeding a first child the ethnic foods of that child's family then they're going to go with the rice cereal. They're gonna go with the general guidelines and so how do we change that in our society?
Lack of accessibility	6	Mhmm, that is a barrier because you do not have any 'āina [land] to work, not unless you go to someplace where you know you can harvest. It's a huge barrier. Because when you start talking about pineapple that is a good thing that we can offer. Our traditional foods, you're talking about the sweet potato, you're talking about the, these are the things that you can plant in your backyard and you can grow really quickly. Not unless you know when to harvest it, it is that component. You do not have that here. I watch these up in the condo and they have trees up there. Useless the trees, you cannot eat the tree. You can't put anything out there to eat. And life itself is all about food. Yeah, yeah well right now, I don't think there's much farmers in here that does that. It's more like me, I think, who does that.
Education	6	I think it really comes down to the 'ike, the knowledge, and through schools, whether it's through lunch programs, whether it's through PTA meetings, booster clubs, everywhere that families can be, if we can get, if we can have a spokesperson in each of those areas that are willing to bring forth this knowledge so that, and then in preschools that have babies in there already beginning to allow this cultural partnership. Until that happens it makes it difficult for many of them to even think. When we think of our state having over a million people, a million plus throughout all these islands, and if you really look at the percentage of how many know. It's something that needs to be educated in school. Not just us as parents now. My grandkids, they should be educated on the Hawaiian foods and then they can make the choice whether to do the Hawaiian food, and feed Hawaiian and eat this stuff you know.
Busy	5	Today, babies don't really suck, everything is so convenient, I mean past the point of convenient. It is almost like enabling. That is the way I look at it, I mean for my mo'opuna [grandchildren], I'm not saying we didn't buy some of the baby jars. But you didn't see me buying meats and all that other stuffs. I didn't buy snacks, I bought fruits they were jarred, it was the Gerber's bananas, the pears, prunes, some prunes not a lot of prunes but it was the fruit that I did not have access to. Like the grapes we would smash the grapes and once it was really palahē [smashed] it was easy for the baby to enjoy that. That would be their candy. Today it's just the market for baby food is just crazy. It's just, my daughter walks around with a whole a lot of stuff in the diaper bag that we don't even use. A whole lot of the squeezable, we not doing that. Because the time that you spend in the māla [garden] or you know fishing is the time that you're not doing the other things. Grading your kid's homework, or taking your kids to soccer. Or all of these other kinds of pressure young parents have now.

linked to the passing down of knowledge by the kūpuna (36). Premastication has been generally viewed negatively due to its association with the risk of diarrhea (37), but a call has been put forth for further research to assess the impact pre-mastication has on health outcomes because it is especially common in traditional cultures (38). For example, an ethnographic study of Woodland Cree mothers, including elders, in northern Alberta reported pre-mastication of food for their infants (39).

Other interesting findings in this study were in relation to how kūpuna learned to feed their infants. First, this study found that females in the family were a predominant source of information. This finding was similar to other studies done in Native American communities (40) and in Brazil (41). Another interesting finding was the role of self-teaching, which was also in common with a study done in Europe (42). However, what was surprising was that this study did not find that health care professionals played a role in shaping infant feeding practices, which was not unlike the study completed in Brazil (41) or Europe

(42). This finding provides another example of the passing of intergenerational knowledge across the family unit. Traditionally, the Hawaiian family unit is derived from the 'ohā (corm) or kalo grown from the original kalo stalk and functions as "the most practical of socio-economic-educational units" (36).

In regard to engaging in cultural practices related to infant feeding, the importance of passing on knowledge shared by this group of kūpuna was similar to findings in other Pacific Islander grandparents. A qualitative inquiry done in Maori and Samoan grandparents in Auckland, New Zealand, found that the generational transfer of knowledge is a key strategy in the development of knowledge and social values (43).

A limitation of this study is that the kūpuna did not necessarily live with their grandchildren and therefore their influence on their grandchildren's diet could be varied. Evidence suggests that the prevalence of children living in multigenerational households with grandparents is rising (44). This could be more prevalent for Native Hawaiian

households, which are already more likely to have an older adult living with a grandchild (21). However, we were able to gather their experiences across multiple time points in their life course. Another limitation is that the influences on complementary feeding practices of the kūpuna might not be limited to their Native Hawaiian identity. All of the kūpuna were part-Hawaiian, and there could have been influences from their other racial and/or ethnic identities influencing their viewpoint. This study also was not able to identify any kūpuna who currently resided in Hawai'i County or Kaua'i County or any kūpuna who grew up in Hawai'i County. During the time of the study there were a number of events (e.g., hurricane, volcanic eruption, and cultural protests) that hampered the research team's ability to find kūpuna from these counties. All research team members were residents of a different county, Honolulu. Finally, this study's findings might have been influenced by participant and researcher bias. Participants might have been compelled to respond in a certain way to meet the desirability of the researchers. To minimize this, questions were open-ended to prevent the kūpuna from simply agreeing. To minimize the influence of researcher bias, interview questions were ordered to start generally and all data obtained were analyzed multiple times using >1 reviewer.

This study was able to identify specific Hawaiian complementary feeding practices implemented across generations as told by kūpuna. These findings will inform future work examining the intergenerational knowledge of traditional Hawaiian complementary feeding practices between grandparents, parents, and children. These findings also indicate the prominent role that kūpuna have, especially kūpunawahine (grandmothers), in feeding infants and therefore programs seeking to influence Hawaiian infant feeding practices might want to involve kūpuna.

Acknowledgments

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