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**AVAILABILITY AND IODINE CONTENT OF SALT AND SALTY CONDIMENTS IN
HOUSEHOLDS AND MARKETS IN REMOTE COMMUNITIES IN JIMI, KEROWAGI, SINA-
SINA AND OKAPA DISTRICTS, PAPUA NEW GUINEA**

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ABSTRACT:

Iodine deficiency (ID) is recognized as the world's greatest single cause of preventable mental retardation in communities with low dietary consumption of iodine. Universal salt iodization (USI), is the universally agreed strategy for the control of ID. Communities in remote mountainous regions in Papua New Guinea (PNG) are considered to be most at risk of developing ID. This project rapidly assesses the status of salt iodization in the remote communities in three provinces in PNG. There are three separate analytical sections in this technical report. The first section presents the data and interpretations of the rapid assessment of the use of salt, salty condiments, and flavourings in households in remote communities in three provinces. The second section presents the data and interpretation of the rapid market survey that assessed the availability of staple foods and condiments in markets in these remote communities. The third section presents the quantitative analysis of iodine content in the salt samples collected from the markets. Each study was a prospective community based cross-sectional survey conducted by certified interviewers. The study sites were Jimi district in Jiwaka province, Kerowagi and Sina-Sina districts in Simbu province, and Okapa district in Eastern Highlands Province in PNG. Two different self-designed pretested questionnaires were used. One for the households and the other for the markets. Convenience sampling technique was used for selection of participants. The interviewers visited randomly selected households and markets in the villages in selected Local Level Government (LLG) areas and administered the appropriate questionnaires. The response rate was based on the willingness of a respondent to participate in the study. Both English and Tok-Pisin versions of the two sets of questionnaires were presented to each of the respondents. The completed questionnaires were checked, sorted and coded. During the distribution of the questionnaires to the respondents in the markets, the interviewers checked and recorded the various items available for sale in the market stalls. They purchased samples of each of the items. The questionnaires and the items purchased from the markets were transported to the Micronutrient Research Laboratory (MRL). In the MRL, the questionnaires were recorded and the data entered into Excel Spreadsheets. The data were analysed using the Excel Data Pack. Quantitative assay of iodine content in each of the samples was carried out using the WYD Iodine Checker. The criteria used for interpretation of the salt iodine results were based on the PNG Salt Legislation. In each of the four districts that participated in this study, the findings show that commercial packaged salt was available in more than 85% of the households. Similarly, over 85% of respondents in the households were aware of the importance of iodized salt. Salt was available in over 95% of the

market stalls in all the districts. In addition most of the salt available in the market stalls were adequately iodized according to the PNG salt legislation. More detailed survey is required to confirm the findings of this rapid survey.

Keywords: Salt Iodization, Iodine content, Remote communities, Sample, Papua New Guinea

INTRODUCTION:

The trace element Iodine is required for the biosynthesis of thyroid hormones, which are essential for growth and development. Low bioavailability or deficiency of this trace element usually leads to a spectrum of disorders called iodine deficiency disorders (IDD) [1, 2]

Iodine deficiency (ID) is considered as the world's greatest single cause of preventable mental retardation in communities with low dietary intake of iodine [1, 2, 3]. The recommended first-line strategy for the control and elimination of ID is Universal Salt Iodisation (USI). This is the policy of iodising all salts used in households, food processing, catering and agriculture [1, 2]. The USI was implemented in Papua New Guinea (PNG) in June 1995 following promulgation of the PNG Salt Legislation, banning the importation and sale of non-iodised salt [4]. It was incorporated in the PNG Food Sanitation Regulation issued in 2007 [5]. Systemic monitoring is required for effective implementation of the USI policy [1].

An assessment of some of the recent data on iodine status and availability of iodised salt

among the population in some districts in PNG seems to indicate that the commercial salt sold in retail shops are adequately iodised and iodine status of the general population in major cities is adequate [6 – 11]. The results also indicated that there are remote communities that have very low access to commercial salt, and indications of prevalence of mild to moderate iodine deficiency, especially among school-age children [6 – 10]. It therefore became necessary to assess the awareness and availability of commercial salt in the households and markets, and whether the salt is adequately iodised or not, and also the availability of other foodstuffs and condiments that might be used as carriers of iodine to meet the dietary needs of residents in the remote communities. The decision was made to carry out rapid survey to assess the availability and use of commercial salt in selected remote communities in three provinces in PNG.

The three major objectives were:

Rapid assessment (appraisal) of the use of salt, salty condiments and flavourings in households in remote communities in three provinces.

Rapid market survey to assess the availability of staple foods and condiments in some markets in remote communities in the three provinces.

Quantitative assay of Iodine content in brands of salt collected from market stalls during the rapid market survey in the three provinces.

METHODOLOGY:

This prospective community based cross-sectional surveys were conducted by selected interviewers trained by the National Department of Health (NDoH) in PNG. They visited the various households and markets in the villages in selected Local Level Government (LLG) areas in the three provinces and administered the two sets of questionnaires. Convenience sampling technique was used for selection of participants. Each of the completed questionnaires were rechecked by the interviewers.

Survey sites:

The survey sites were villages in Local Level Government (LLG) areas in Jimi district Jiwaka province, Kerowagi district Simbu province, Sina-Sina Yonggomugl districts in Simbu province and Okapa district Eastern Highlands province (EHP). Some of the LLG sites were as follows.

LLG in Jiwaka province: Kol, Tapibuga, Koma, Koinambe.

LLG in Simbu province: Suai, Tabare, Yongomulg, Upper Koronigle, Lower Koronigle, Kup, Gena Waugla. LLG in EHP: East Okapa, Mage, Kasogu, Siru-Haga, Yagusa, Pularasa, East Okapa

Survey instrument:

Two separate pre-designed semi-structured questionnaires were used. Each of the questionnaires, in both English and Tok-Pisin, were pre-tested in a rural LLG among selected households and markets in two different villages in Okapa district EHP. Feedback and suggested changes were provided orally and in writing. The feedback was used to adapt and improve the two versions of the questionnaires that were used in the survey.

Data collection:

Data was collected for the three separate analytical sections in this report. The first section presents the data for the rapid assessment of the use of salt, salty condiments and flavourings in households in remote communities in three provinces. The completed questionnaires were collected from households in Jimi district in Jiwaka province, Kerowagi and Sina-Sina districts in Simbu province and Okapa district in EHP. All the questionnaires were clearly labelled.

The second section was the rapid market survey to assess the availability of staple

foods and condiments in markets in the remote communities in the three provinces. The questionnaires completed by the stall-owners in the markets in Jimi district and Okapa district were clearly labelled. However, the questionnaires from stall-owners in markets in Kerowagi district and Sina-Sina Yonggomugl district were packed together in a single box. The questionnaires were not clearly labelled. Thus, in order to avoid errors in separating the questionnaires into the two districts (Kerowagi and Sina-Sina), they were coded and entered in the Excel Spreadsheet as Simbu province. This same problem was repeated in the third section. The salt samples from markets in Kerowagi and Sina-Sina districts were packeted together in three boxes but they were not clearly labelled to indicate the districts. Thus, the samples were analysed and presented for market stalls in Kerowagi & Sina-Sina in Simbu province. The iodine content in all the salt and other samples collected from the markets were quantitatively determined.

The survey was carried out between July and September 2022. The questionnaires and samples were delivered to the Micronutrient Research Laboratory (MRL) in the Division of Basic Medical Sciences (BMS) School of Medicine and Health Sciences (SMHS) University of Papua New Guinea (UPNG) for analyses. The questionnaires were sorted

recoded and the data entered into Excel Spreadsheets for calculations and interpretation.

RESULTS AND INTERPRETATION:

Rapid assessment (appraisal) of the use of salt, salty condiments and flavourings in households in remote communities in three provinces: This section of the technical report presents the data obtained from the questionnaires completed by the respondents in the households in Jimi district in Jiwaka province, Kerowagi and Sina-Sina districts in Simbu province, and Okapa district in Eastern Highlands Province in PNG.

In Jimi district a total of 450 questionnaires were randomly distributed among the households (HH), but only 417 agreed to participate. This gave a response rate of 97.0% (417/430). In Kerowagi district 300 questionnaires were distributed, but 287 were completed and found suitable for analysis, the response rate was 95.7% (287/300). The response rate in Sina-Sina district was 95.4% (310/325). In Okapa district the response rate was 96.9% (252/260).

Socio-demographic characteristics of the respondents:

Table 1 summaries the socio-demographic characteristics of the respondents in each of

the four districts. The age range for respondents in Jimi, Kerowagi, Sina-Sina and Okapa were 17 – 92 years, 16 – 68 years, 18 – 85 years and 19 – 72 years respectively.

The gender distribution and mean age of the respondents in each of the four districts are also presented in Table 1. The number of females were significantly higher than that of males in Jimi district 58.8% (245/417) and Kerowagi district 62.0% (178/287).

The respondents were asked if they had a salaried job or if they work for money. Most of the respondents in Jimi (89.2%), in Kerowagi (90.2%), Sina-Sina (71.9%) and Okapa (88.9%) said that they do not have a job with salary. This was because most of them are subsistence farmers. They do not consider the amount of money that they receive after selling their products as salaries.

Availability and awareness of Iodized Salt and use of Salty Condiments, Flavourings, and Fortification Food Vehicles: This section of the questionnaire contains a total of 13 questions. The summary of the results obtained for each of the four districts are presented in Table 2.

The respondents were asked the question (Q1) “Does your household use anything to give food a salty taste?” A total of 99.3% of

respondents in Jimi, 92.0% in Kerowagi, 97.1% in Sina-Sina and 92.5% in Okapa said “YES”.

Those respondents were then asked the second question (Q2) “If you responded “YES” to Q1, please tell me which of these products you use in your household (select the different products)” Five groups of products were listed for selection.

Commercial packaged salt bought in the markets or shops was selected by 100% of the respondents in both Jimi and Kerowagi, 94.7% respondents in Sina-Sina and 86.3% in Okapa districts.

Stock / bouillon cubes was selected by 50.7%, 87.9%, 30.9% and 16.3% of respondents in Jimi, Kerowagi, Sina-Sina and Okapa respectively.

The results for *Seasoning salt/powder* and *Seasoning sauce* are presented in Table 2.

Traditional salt/local salt was selected by 27.0% of respondents in Okapa and 12.9% in Kerowagi compared to 0.2% in Jimi and 0.7% in Sina-Sina districts.

The respondents were then asked Q3: “For the product you use in your household, please tell me how often you use them”.

Commercial salt was used daily by 89.1%, 92.0%, 85.3% and 93.5% of respondents in Jimi, Kerowagi, Sina-Sina and Okapa districts respectively. The other frequency of

uses of commercial salt are presented in Table 2.

Stock Bouillon cubes were used several times a week by 55.2% and 49.6% of respondents in Jimi and Kerowagi respectively, compared to 33.3% of respondents in Sina-Sina and 47.4% in Okapa that used them once a week.

The third product, *Seasoning salt /powder* was used daily by 35.4% of respondents in Jimi, 20.9% in Kerowagi and 47.1% in Sina-Sina.

Seasoning sauce was used several time a week by 61.1% respondents in Jimi, once a week by 42.1% in Okapa, once a month by 50.1% in Kerowagi and 67.8% in Sina-Sina.

Traditional / local salt was used by 69.8% in Okapa several times a week compared to 44.1% that used it once a month in Kerowagi. The other results are presented in Table 2.

In order to assess the availability of commercial salt in the HH, the respondents were asked (Q4) “Does your family have commercial packaged salt bought in market/shop in the household today?”

In Jimi 73.9%, in Kerowagi 91.7%, in Sina-Sina 81.1% and in Okapa 83.3% of the respondents answered in the “affirmative”.

Those that answered in the *negative* were asked (Q5), *if the HH had commercial packaged salt bought in the market/shop on any day in the last 7 days*. The response was

“Yes” by 88.0%, 90.9%, 100% and 74.4% of respondents in Jimi, Kerowagi, Sina-Sina and Okapa respectively.

The results indicated that within the last seven days, 96.9% (404/414) of HH in Jimi, 98.2% (262/264) of HH in Kerowagi, 100% (301/301) of HH in Sina-Sina and 95.7% (223/233) of HH in Okapa had commercial packaged salt bought in the market/salt.

The respondents were then asked (Q6) “What do you do with the salt bought at market/shop (select as many as apply)?” Four options were provided; they were asked to select as many as possible.

In response to (Q6), 90.8% in Jimi, 80.9% in Kerowagi, 97.7% in Sina-Sina and 77.6% in Okapa stated that they use salt for cooking and add to food before eating. This was the major use of salt indicated by respondents in the four districts. The present frequency of the other options used are presented in Table 2.

The next seven questions (Q7 to Q13) were to assess the availability in HH of some commercial products that can be fortified.

To obtain information about the availability of *wheat flour* and *wheat flour products* in the HH the respondents were asked Q7, Q8, Q9.

Question 7 (Q7) was “Does your household have wheat flour or wheat flour foods such as dried noodles, pasta, macaroni, instant

noodles; 2-minute noodles, bread, buns, rolls, cake, crackers, biscuits, scones, donuts today?"

The responses were "Yes" by 30.7%, 40.1%, 41.6% and 64.3% of respondents in Jimi, Kerowagi, Sina-Sina and Okapa respectively.

The follow up question (Q8) to those that said "No" was *"If No, did your household have wheat flour or wheat flour foods such as dried noodles, pasta, macaroni, instant noodles, 2-minute noodles, bread, buns, rolls, cake, crackers, biscuits, scones, donuts on any day in last 7 days?"*

The responses were "Yes" by 74.0%, 65.7%, 59.7% and 45.6% of respondents in Jimi, Kerowagi, Sina-Sina and Okapa respectively.

The results indicated that within the last seven days, 82.0% (342/417), 79.4% (228/287), 76.5% (237/310) and 80.6% (203/252) of HH in Jimi, Kerowagi, Sina-Sina and Okapa respectively had some wheat flour products in the HH.

The next question (Q9) was to those respondents that said "Yes" to Q7 or Q8. *"If you responded "Yes" to Q7 or Q8, which food do you have in your HH (tick any that apply)?"*

The respondents were asked to choose as many as necessary from the options given.

The most popular wheat flour product selected by respondents in the four districts was "Instant noodles/2-minute noodles". Jimi 95.3%, Kerowagi 90.8%, Sina-Sina 69.2% and Okapa 77.3%.

Wheat flour was selected by 31.7% in Jimi, 35.5% in Kerowagi, 44.3% in Sina-Sina and 14.3% in Okapa.

Q10 & Q11 were about the availability of "Rice" in the HH.

All the respondents were asked Q10: *"Does your HH have rice today?"* On the day of the survey rice was available in 33.6% of the HH in Jimi, 36.2% in Kerowagi, 48.7% in Sina-Sina and 55.6% in Okapa.

Q11 was directed to those respondents that did not have rice in the house on the day of the survey.

The question was, *"If "No" did your HH have rice any day in last 7 days?"* The responses are presented in Table 2. The results show that within the last seven day, rice was available in 82.0% (343/417) of HH in Jimi, 77.8% (206/287) in Kerowagi, 92.9% (288/310) in Sina-Sina and 84.1% (212/252) in Okapa.

All the respondents were also asked (Q12 & Q13) about the availability of "Cooking oil" in their HH.

On the day of the survey the question (Q12) was *"Does your HH have cooking oil today?"*

Cooking oil was available in 85.1% of HH in Jimi, 73.5% in Kerowagi, 81.9% in Sina-Sina and 81.3% in Okapa.

The follow up question (Q13) to those without cooking oil was, "If No, did your household have cooking oil on any day in last 7 days?"

The responses are presented in Table 2. The

results show that in the last seven days, cooking oil was available in 86.3% (360/417) of HH in Jimi, 96.9% (278/287) of HH in Kerowagi, 97.4% (302/310) HH in Sina-Sina and 91.3% (230/252) HH in Okapa.

TABLE 1: Socio-demographic characteristics of respondents in the four districts

Socio-demographic characteristics of respondents in				
DISTRICT / PROVINCE	Jimi / JIWAKA	KEROWAGI / SIMBU	SINA-SINA SIMBU	OKAPA EHP
Number of respondents	417	287	310	252
Gender				
Females	245 (58.8%)	178 (62.0%)	138 (44.5%)	127 (50.4%)
Males	172 (41.2%)	109 (38.0%)	172 (55.5%)	125 (49.6%)
Age in years				
Mean age of females (years)	38	35	42	40
Mean age of males (years)	42	43	43	40
Mean age of respondents (years)	40	39	42	40
Age range of respondents (years)	17 – 92	16 – 68	18 – 85	19 – 72
Do you have a job with salary (pay?) or do you work for money?				
Yes	10.8% (45/417)	9.8% (28/287)	28.1% (87/310)	11.1% (28/252)
No	89.2% (372/417)	90.2% (259/287)	71.9% (223/310)	88.9% (224/252)

Table 2: Availability and awareness of iodised salt, and use of salty condiments, flavourings, and fortification food vehicles

Availability and awareness of iodised salt, and use of salty condiments, flavourings, and fortification food vehicles					
DISTRICT / PROVINCE	Jimi / JIWAKA	KEROWAGI / SIMBU	SINA-SINA SIMBU	OKAPA EHP	
Number of respondents	417	287	310	252	
Q 1: Does your household use anything to give food a salty taste?					
Q1	1. Yes	99.3% (414/417)	92.0% (264/287)	97.1% (301/310)	92.5% (233/252)
	2. No	0.7% (3/417)	8.0% (23/287)	2.9% (9/310)	7.5% (19/252)
	3. Not sure	0	0	0	0
Q 2: If you responded YES to Q 1, please tell me which of these products you use in your household (select all the products that applies)					
Q2	1. Commercial packaged salt bought at market / shop:	100% (414/414)	100% (264/264)	94.7% (285/301)	86.3% (201/233)
	2. Stock / bouillon cubes:	50.7% (210/414)	87.9% (232/264)	30.9% (93/301)	16.3% (38/233)
	3. Seasoning salt / powder:	31.4% (130/414)	32.6% (86/264)	23.3% (70/301)	1.7% (4/233)

	4. Seasoning sauce:	16.9% (70/414)	15.9% (42/264)	9.3% (28/301)	3.0% (7/233)
	5. Traditional / local salt	0.2% (1/414)	12.9% (34/264)	0.7% (2/301)	27.0% (63/233)
Q3: For the product you use in your household, please tell me how often you use them.					
Commercial package salt bought in market / salt:					
	1. Everyday	89.1% (369/414)	92.0% (243/264)	85.3% (243/285)	93.5% (188/201)
	2. Several times a week	5.8% (24/414)	6.8% (18/264)	11.9% (34/285)	6.5% (13/201)
	3. Once a week	2.9% (12/414)	0.8% (2/264)	2.8% (8/285)	0
	4. Once a month or less	2.2% (9/414)	0.4% (1/264)	0	0
Stock bouillon cubes:					
	1. Everyday	17.1% (36/210)	19.8% (46/232)	12.9% (12/93)	7.9% (3/38)
	2. Several times a week	55.2% (116/210)	49.6% (115/232)	32.3% (30/93)	34.2% (13/38)
	3. Once a week	11.9% (25/210)	12.1% (28/232)	33.3% (31/93)	47.4% (18/38)
	4. Once a month or less	15.7% (33/210)	18.5% (43/232)	21.5% (20/93)	10.5% (4/38)
Seasoning salt / powder:					
	1. Everyday	35.4% (46/130)	20.9% (18/86)	47.1% (33/70)	0
	2. Several times a week	33.8% (44/130)	25.6% (22/86)	21.4% (15/70)	75.0% (3/4)
	3. Once a week	24.6% (32/130)	23.3% (20/86)	22.9% (16/70)	25.0% (1/4)
	4. Once a month or less	6.2% (8/130)	30.2% (26/86)	8.6% (6/70)	0
Seasoning sauce:					
	1. Every day	4.4% (3/68)	4.8% (2/42)	3.6% (1/28)	14.3% (1/7)
	2. Several times a week	69.1% (47/68)	11.9% (5/42)	3.6% (1/28)	14.3% (1/7)
	3. Once a week	20.6% (14/68)	33.3% (14/42)	25.0% (7/28)	42.9% (3/7)
	4. Once a week or less	5.9% (4/68)	50.0% (21/42)	67.8% (19/28)	28.5% (2/7)
Traditional / local salt:					
	1. Every day	0	29.4% (10/34)	0	22.2% (14/63)
	2. Several times a week	0	11.8% (4/34)	(2/2)	69.8% (44/63)
	3. Once a week	(1/1)	14.7% (5/34)	0	6.4% (4/63)
	4. Once a month or less	0	44.1% (15/34)	0	1.6% (1/63)
Q 4 Does your family have commercial packaged salt bought in market/shop in the household today?"					
	1. Yes	73.9% (306/414)	91.7% (242/264)	81.1% (244/301)	83.3% (194/233)
	2. No	26.1% (108/414)	8.3% (22/264)	18.9% (57/301)	16.7% (39/233)
	3. Not sure	0	0	0	0
Q 5 If No, did your household have commercial packaged salt bought at market / shop any day in the last 7 days?					

	1. Yes	88.0% (95/108)	90.9% (20/22)	100.0% (57/57)	74.4% (29/39)
	2. No	12.0% (13/108)	9.1% (2/22)	0	25.6% (10/39)
Q6	What do you do with the commercial packaged salt bought at market / shop? (Select as many as possible) (Respondents gave multiple answers)				
	1. Use for cooking and add to food before eating	90.8% (364/401)	80.9% (212/262)	97.7% (294/301)	77.6% (173/223)
	2. Use for cooking only	16.0% (64/401)	34.7% (91/262)	21.6% (65/301)	15.2% (34/223)
	3. Add to food before eating only	49.6% (199/401)	35.5% (93/262)	24.3% (73/301)	7.2% (16/223)
	4. Other uses (Specify)	29.4% (118/401)	13.7% (36/262)	14.3% (43/301)	0
Q7	Does your household have wheat flour or wheat flour foods such as dried noodles, pasta, macaroni, instant noodles; 2-minute noodles, bread, buns, rolls, cake, crackers, biscuits, scones, donuts today?				
	1. Yes	30.7% (128/417)	40.1% (115/287)	41.6% (129/310)	64.3% (162/252)
	2. No	69.3% (289/417)	59.9% (172/287)	58.4% (181/310)	35.7% (90/252)
Q8	If No, did your household have wheat flour or wheat flour foods such as dried noodles, pasta, macaroni, instant noodles, 2-minute noodles, bread, buns, rolls, cake, crackers, biscuits, scones, donuts on any day in last 7 days?				
	1. Yes	74.0% (214/289)	65.7% (113/172)	59.7% (108/181)	45.6% (41/90)
	2. No	26.0% (75/289)	34.3% (59/172)	40.3% (73/181)	54.4% (49/90)
Q9	If you responded Yes to question 7 or 8, which food did you have in your household (tick all that apply)? {Values do not add up to 100%}				
	1. wheat flour	31.7% (129/342)	35.5% (81/228)	44.3% (105/237)	14.3% (29/203)
	2. dried noodles/macaroni/pasta	3.2% (11/342)	17.5% (40/228)	4.6% (11/237)	11.3% (23/203)
	3. Instant noodles/2-minute noodles	95.3% (326/342)	90.8% (207/228)	69.2% (164/237)	77.3% (157/203)
	4. Bread/buns/rolls/	0.3% (1/342)	5.7% (13/228)	6.3% (15/237)	0
	5. Crackers/biscuits	25.1% (86/342)	21.1% (48/228)	8.9% (21/237)	2.0% (4/203)
	6. Cake/scones/donuts	2.0% (7/342)	19.3% (44/228)	0.8% (2/237)	0
	7. Other wheat flour food (Specify)	36.8% (126/342)	8.3% (19/228)	6.8% (16/237)	2.0% (4/203)
Q10	Does your household have rice today?				
	1. Yes	33.6% (140/417)	36.2% (104/287)	48.7% (151/310)	55.6% (140/252)
	2. No	66.4% (277/417)	63.8% (183/287)	51.3% (159/310)	44.4% (112/252)
Q11	If No, did your household have rice any day in the last 7 days?				
	1. Yes	72.9% (202/277)	55.7% (102/183)	86.2% (137/159)	64.3% (72/112)
	2. No	27.1% (75/277)	44.3% (81/183)	13.8% (22/159)	35.7% (40/112)
Q12	Does your household have oil today?				
	1. Yes	85.1% (355/417)	73.5% (211/287)	81.9% (254/310)	81.3% (205/252)
	2. No	14.9% (62/417)	26.5% (76/287)	18.1% (56/310)	18.7% (47/252)
Q13	If No, did your household have oil any day in the last 7 days?				

1. Yes	8.1% (5/62)	88.2% (67/76)	85.7% (48/56)	53.2% (25/47)
2. No	91.9% (57/62)	11.8% (9/76)	14.3% (8/56)	46.8% (22/47)

RESULTS AND INTERPRETATION:

Rapid market survey to assess the availability of staple foods and condiments in some markets in remote communities in three provinces:

This section of the technical report presents the data obtained from the questionnaires completed by the owners (or representatives) of stalls in markets in Jimi district in Jiwaka province, Kerowagi and Sina-Sina districts in Simbu province, and Okapa district in EHP.

In Jimi district 110 questionnaires were from traders in the market stalls in the different villages that participate in the study. The questionnaires for Kerowagi district and Sina-Sina district were in one box. A total of 163 questionnaires were completed by traders in market stalls in the different villages in the two districts. In Okapa district 145 questionnaires were completed by traders in market stalls in the various villages. The response rates for each of the districts were not calculated because only the completed questionnaires were submitted for data entry and analysis.

Socio-demographic characteristics of the Traders:

The mean ages of the respondents in Jimi, Simbu and Okapa were 39.0 years, 37.6 years and 34.8 years respectively. The age range for respondents in Jimi, Simbu and Okapa were 15 - 77 years, 14 – 69 years and 17 – 75 years respectively. Gender was not indicated in the questionnaires.

Availability of Salt, Staple Foods, Condiments and Flavourings:

This section of the questionnaire contains three questions. The summary of the results obtained for each of the districts are presented in Table 3.

The respondents were asked **question 1 (Q 1) “Is this product available at this stall?”**

The list of nine products indicated in Table 3 was shown to each of the respondents.

“**Commercial packaged salt**” was the first product in the list. It was available in 98.2% (108/110), 98.2% (160/163) and 100% (145/145) of the market stalls in Jimi, Simbu and Okapa respectively on the day of the survey.

The next in the list was “**Stock / bouillon cubes**”. They were available in 94.5% (104/110) of the market stalls in Jimi, 67.8% (110/163) of the market stalls in Simbu and 97.2% (141/145) of the market stalls in Okapa.

The next was “**Seasoning Salt/Powder**”: They were available in 13.6% (15/110) of the market stalls in Jimi, 16.6% (27/163) in Simbu and 44.1% (64/145) in Okapa. Results for “**Seasoning sauce**” and “**Traditional salt / local salt**” are presented in Table 3.

Next was “**Wheat flour**”: They were available in 64.5% (71/110), 49.7% (81/163) and 67.6% (98/145) of the market stalls in Jimi, Simbu and Okapa respectively.

These results were in contrast to the availability of “**Wheat flour products**” in the market stalls (Table 3). In Jimi 97.3% (107/110), in Simbu 87.1% (142/163) and in Okapa 100% (145/145) of the market stalls had wheat flour products on the day of the survey.

The next was “**Rice**”. They were available in 99.1% (109/110) of the stalls in Jimi, 84.7% (138/163) of the stalls in Simbu and 98.6% (143/145) of the market stalls in Okapa.

The results show that “**Cooking Oil**” was available in 96.4% (106/110), 96.9%

(158/163) and 98.6% (143/145) of the market stalls in Jimi, Simbu and Okapa respectively.

The next question (Q 2) was to assess the different brands of products available in the market stalls. The respondents were asked:

Q 2: “For all the products available, indicate the different brands available. For traditional salt indicate the type available”

“**Brands of Commercial Packaged salt**”:

Five brands of commercial packaged salt were available in market stalls in Jimi district. Star salt, True-cook salt and Pacific salt were available in 98.1% (106/108), 47.2% (51/108) and 22.2% (24/108) respectively in market stalls in Jimi district. The others are presented in Table 3.

In Simbu, eight brands of commercial package salt were available in market stalls. Star salt, True-cook salt and Jumbo-salt brands were available in 63.1% (101/160), 29.4% (47/160) and 28.1% (45/160) respectively. The other brands are indicated in Table 3.

In Okapa, five brands of commercial packaged salt were in the market stalls. Of the five brands, Star salt was available in 79.3% (115/145), followed by True cook salt available in 47.6% (69/145) market stalls. The other brands are indicated in Table 3.

“Brands of Stock / bouillon cubes”:

Four brands were available in market stalls in Jimi, six brands in Simbu and only one brand in Okapa.

Maggie Kakaruk Stock cubes were available in 86.5% (90/104), 68.2% (75/110) and 100% (141/141) of the market stalls in Jimi, Simbu and Okapa respectively. The other brands are shown in Table 3.

“Brands of Seasoning Salt / Powder”:

Four different brands were available in market stalls in Jimi. Topmi (VC – Tsin) was available in 33.3% (5/15), Curry powder was available in 26.7% (4/15) and Teisti Rais was also available in 26.7% (4/15) of market stalls.

In Simbu, six different brands were available in market stalls. Curry powder, Maggie salt and Teisti Rais were available in 55.6% (15/27), 33.3% (9/27) and 22.2% (6/27) of market stalls respectively.

Five different brands were available in market stalls in Okapa. Curry powder was in 89.1% (57/64) and Zesi-1 in 28.1% (18/64) of the market stalls. The other brands are shown in Table 2.

“Brands of seasoning sauce”:

Two different brands of *seasoning sauce* were available in market stalls in Jimi and

Simbu, compared to five different brands in market stalls in Okapa.

In Jimi, **Soy sauce** was available in 75.0% (3/4) market stalls and **Mushroom sauce** was available in 25.0% (1/4) market stalls.

In Simbu, **Mushroom sauce** was available in 66.7% (4/6) market stalls and **Soy sauce** was available in 33.3% (2/6) market stalls.

In Okapa, **Soy sauce** was in 87.0% (20/23) market stalls, **Mushroom sauce** in 47.8% (11/23) and **Maggie sauce** in 8.7% (2/23) market stalls. The others are indicated in Table 3.

“Types of Traditional / Local salt”: One type (Rock salt) was available only in market stalls in Okapa.

“Brands of Wheat flour”: Four different brands were available in markets in Jimi, ten different brands in Simbu and five different brands in Okapa.

Plain flour was available in 74.6% (53/71), **Flame flour** in 33.8% (24/71) and the **3-Rose flour** in 23.9% (17/71) of market stalls in Jimi. In Simbu, **Plain flour** was in 48.1% (39/81), **Flame flour** in 23.5% (19/81) and **3-Rose flour** in 38.3% (31/81) of market stalls. The other brands are shown in Table 3. In Okapa market stalls **Plain flour** was in 37.8% (37/98), **Flame flour** in 58.2% (57/98) and **3-Rose flour** in 31.6% (31/98). The other

brands available in the markets stalls are presented in Table 3.

"Types of Wheat flour products": *Instant Noodles/2-minutes Noodles* were available in 99.1% (106/107), 100% (142/142) and 98.6% (143/145) of the market stalls in Jimi, Simbu and Okapa respectively. *Bread/buns/rolls/crackers/biscuits* were available in 93.5% (100/107), 57.7% (82/142) and 92.4% (134/145) of the market stalls in Jimi, Simbu and Okapa respectively.

Brands of Rice: The number of different brands of rice in market stalls in Jimi, Simbu and Okapa were eleven, ten and eleven brands respectively.

Roots rice, Skel rice and *Trukai rice* were available in 90.8% (99/109), 43.1% (47/109) and 30.3% (33/109) of the market stalls respectively in Jimi. The other brands are shown in Table 3.

In Simbu, *Root rice, Skel rice* and *Trukai rice* were available in 79.0% (109/138), 68.1% (94/138) and 18.1% (25/138) respectively of the market stalls. Other brands are shown in Table 3.

For markets in Okapa, *Root rice, Skel rice* and *Trukai rice* were available in 46.9% (67/143), 90.9% (130/143) and 20.3% (29/143) of the stalls. The other brands are shown in Table 3.

"Brands of cooking oil": Eleven different brands of cooking oil were available in

markets in Jimi. *Golden sun oil, Voila oil*, and *Flame oil* were in 64.2% (68/106), 50.0% (53/106) and 33.0% (35/106) of the market stalls respectively. The other brands are shown in Table 3.

In Simbu, a total of fifteen brands of oil were available in the markets. *Mamas cooking oil (Mamas choice)* was available in 45.6% (72/158), *Flame oil* in 28.5% (45/158) and *Golden sun oil* in 25.9% (41/158) of market stalls. The other brands are shown in Table 3.

Eight different brands of cooking oil were on sale in market stalls in Okapa. *Flame oil* was in 62.9% (90/143), *Golden sun oil* in 43.4% (62/143) and *Mamas cooking oil* in 35.7% (51/143) of the market stalls.

The market stall owners were asked Q 3, to determine the most popular brands used in the community.

Q3: "Of the brands listed ask the stall owner which is the brand most frequently purchased?"

"Most frequently purchased brand of Commercial Packaged salt":

The most frequently purchased brand of commercial packaged salt was *Star salt* with the frequency of 88.0% (95/108) in Jimi, 56.9% (91/160) in Simbu and 69.7% (101/143) in Okapa.

“Most frequently purchased brand of Stock / bouillon cubes”:

Maggie Kakaruk Stock cubes were the most frequently purchased in Jimi (77.9%; 81/104), in Simbu (72.7%; 89/110) and in Okapa (100%; 141/141).

“Most frequently purchased brand of Seasoning Salt / Powder”:

In Jimi, **Topmi (VE-Tsin)** was the most frequently purchased (33.3%; 5/15). In Simbu, the most frequently purchased was **Maggie salt/powder** (33.3%; 9/27). **Curry powder** was the most frequently purchased in Okapa (81.3%; 52/64).

“Most frequently purchased brand of seasoning sauce”:

Soy sauce was the most frequently purchased in Jimi (75.0%; 3/4) and Okapa (60.9%; 14/23). **Mushroom sauce** was the most frequently purchased in Simbu (66.7%; 4/6).

“Most frequently purchased brand of wheat flour”:

Plain flour was the most frequently purchased brand in Jimi (73.2%; 52/71) and in Simbu (45.7%; 37/81). In Okapa, **Flame**

flour (50.0%; 49/98) was the most frequently purchased brand of wheat flour’

“Most frequently purchased type of wheat flour product”:

Instant noodles/2-minutes noodles were the most frequently purchased type of wheat flour products in Jimi (99.1%; 106/107), Simbu (100%; 142/142) and Okapa (70.3%; 102/145).

“Most frequently purchased brand of rice”:

Roots rice was the most frequently purchased brand in Jimi (59.6%; 65/109). **Skel rice** was the most frequently purchased brand of rice in Simbu (46.4%; 64/138) and in Okapa (74.8% (107/143).

“Most frequently purchased brand of cooking oil”:

In Jimi markets the most frequently purchased brand of cooking oil was **Golden sun oil** (40.6%; 43/106). **Mamas cooking oil** (27.2%; 43/158) was the most frequently purchased brand in Simbu markets. In Okapa markets **Flame oil** (45.4%; 65/143) was the most frequently purchased brand.

Table 3: Availability of Salt, Staple Foods, Condiments and Flavourings in the markets

	DISTRICT / PROVINCE	JIMI	SIMBU	OKAPA
	N	110	163	145
	Q 1: Is this product available at this stall?			
Q1	Commercial packaged salt	98.2% (108/110)	98.2% (160/163)	100% (145/145)
	Stock / bouillon cubes	94.5% (104/110)	67.5% (110/163)	97.2% (141/145)
	Seasoning salt / powder	13.6% (15/110)	16.6% (27/163)	44.1% (64/145)

	Seasoning sauce	3.6% (4/110)	3.7% (6/163)	15.9% (23/145)
	Traditional / local salt	0	0	0.7% (1/145)
	Wheat flour	64.5% (71/110)	49.7% (81/163)	67.6% (98/145)
	Wheat flour products	97.3% (107/110)	87.1% (142/163)	100% (145/145)
	Rice	99.1% (109/110)	84.7% (138/163)	98.6% (143/145)
	Oil	96.4% (106/110)	96.9% (158/163)	98.6% (143/145)
	Q 2: For all the products available, indicate the different brands available. For traditional salt indicate the type available (NB: multiple brands were available in the stalls)			
	Brands of Commercial packaged salt:	N = 108	N = 160	N = 145
	1 Star salt	98.1% (106/108)	63.1% (101/160)	79.3% (115/145)
	2 Five star salt	0.9% (1/108)	7.5% (12/160)	0
	3 True cook salt	47.2% (51/108)	29.4% (47/160)	47.6% (69/145)
	4 Pacific salt	22.2% (24/108)	0	0
	5 Jumbo salt	0	28.1% (45/160)	0
	6 Supa salt	1.9% (2/108)	6.3% (10/160)	0
	7 Ezy salt	0	0.6% (1/160)	14.5% (21/145)
	8 Saxa salt	0	0.6% (1/160)	8.3% (12/145)
	9 Repackaged salt	0	6.9% (11/160)	0
Q2	10 Kakaruk salt	0	0	1.4% (2/145)
	Brands of Stock bouillon cubes	N = 104	N = 110	N = 141
	1 Maggie cubes	25.0% (26/104)	28.2% (31/110)	0
	2 Maggie Kakaruk Stock cubes	86.5% (90/104)	68.2% (75/110)	100% (141/141)
	3 Chicken flavour cubes	1.9% (2/104)	8.2% (9/110)	0
	4 Super flavor Maggie cubes	0	8.2% (9/110)	0
	5 Beef cubes	0	4.5% (5/110)	0
	6 Stock cubes	1.9% (2/104)	6.4% (7/110)	0
	Brands of Seasoning salt / powder:	N = 15	N = 27	N = 64
	1 Teisti Rais	26.7% (4/15)	22.2% (6/27)	3.1% (2/64)
	2 Topmi (VE-Tsin)	33.3% (5/15)	7.4% (2/27)	0
	3 Coconut milk powder	26.7%	0	0

	(4/15)		
4 Curry powder	26.7% (4/15)	55.6% (15/27)	89.1% (57/64)
5 Vetgur / Vetzin	0	14.8% (4/27)	10.9% (7/64)
6 Zesi-1	0	14.8% (4/27)	28.1% (18/64)
7 Maggie	0	33.3% (9/27)	0
8 Yellow egg	0	0	3.1% (2/64)
Brands of Seasoning sauce:			
	N = 4	N = 6	N = 23
1 Soy sauce	75.0% (3/4)	33.3% (2/6)	87.0% (20/23)
2 Mushroom soy sauce	25.0% (1/4)	66.7% (4/6)	47.8% (11/23)
3 Chilli sauce	0	0	4.3% (1/23)
4 Tomato sauce	0	0	4.3% (1/23)
5 Maggie sauce	0	0	8.7% (2/23)
Type of Traditional / Local salt:			
	N = 0	N = 0	N = 1
1 Ash	0	0	0
2 Rock salt	0	0	100% (1/1)
3 Sea water	0	0	0
Brand of Wheat flour:			
	N = 71	N = 81	N = 98
1 Plain flour	74.6% (53/71)	48.1% (39/81)	37.8% (37/98)
2 Flame flour	33.8% (24/71)	23.5% (19/81)	58.2% (57/98)
3 3-Rose flour	23.9% (17/71)	38.3% (31/81)	31.6% (31/98)
4 Whole meal flour	38.0% (27/71)	18.5% (15/81)	22.4% (22/98)
5 Wheat scone flour balls	0	2.5% (2/81)	0
6 Scone flour	0	8.6% (7/81)	0
7 Self-Raising plain flour	0	1.2% (1/81)	11.2% (11/98)
8 Bakers flour	0	4.9% (4/81)	0
9 Brown wheat bakers flour	0	3.7% (3/81)	0
10 Skai flour	0	0	0
11 Skow flour	0	1.2% (1/81)	0
Do you have wheat flour products:			
Yes	97.3% (107/110)	87.1% (142/163)	100% (145/145)

No	2.7% (3/110)	12.9% (21/163)	0
Types of wheat flour products:	N = 107	N = 142	N = 145
1 dried noodles/macaroni/pasta	18.7% (20/107)	2.1% (3/141)	2.1% (3/145)
2. Instant noodles/2-minute noodles	99.1% (106/107)	100% (142/142)	98.6% (143/145)
3. Bread/buns/rolls/Crackers/Biscuits	93.5% (100/107)	57.7% (82/142)	92.4% (134/145)
4. Cake/scones/donuts	0	28.2% (40/142)	1.4% (2/145)
Brands of Rice:	N = 109	N = 138	N = 143
1 Roots rice	90.8% (99/109)	79.0% (109/138)	46.9% (67/143)
2 Skel rice	43.1% (47/109)	68.1% (94/138)	90.9% (130/143)
3 Trukai rice	30.3% (33/109)	18.1% (25/138)	20.3% (29/143)
4 Long grain rice	54.1% (59/109)	46.4% (64/138)	0.7% (1/143)
5 Star rice	1.8% (2/109)	2.2% (3/138)	41.3% (59/143)
6 Wantok rice	0	0.7% (1/138)	6.3% (9/143)
7 Jasmine rice	3.7% (4/109)	4.3% (6/138)	3.5% (5/143)
8 Ezy cook rice	0	1.4% (2/138)	0
9 Super A1 rice	18.3% (20/109)	0.7% (1/138)	11.9% (17/143)
10 Frangipani rice	3.7% (4/109)	0	18.9% (27/143)
11 Sun long rice	10.1% (11/109)	0.7% (1/138)	0
12 Ori rice	11.0% (12/109)	0	2.8% (4/143)
13 Kumul rice	11.9% (13/109)	0	3.5% (5/143)
Brands of cooking oils:	N = 106	N = 158	N = 143
1 Mamas cooking oil (Mamas choice)	22.6% (24/106)	45.6% (72/158)	35.7% (51/143)
2 Jumbo oil	0	0.6% (1/158)	0
3 Vegetable oil	0	11.4% (18/158)	0
4 Sun shine oil	0.9% (1/106)	4.4% (7/158)	0.7% (1/143)
5 Sunflower oil	0	10.1% (16/158)	0
6 Flame oil	33.0% (35/106)	28.5% (45/158)	62.9% (90/143)
7 Patna oil	0	3.8% (6/158)	0
8 Sun Rise oil	4.7% (5/106)	3.8% (6/158)	0

	9 Golden Sun oil	64.2% (68/106)	25.9% (41/158)	43.4% (62/143)
	10 Highlands Meadow	4.7% (5/106)	8.2% (13/158)	0
	11 Voila oil	50.0% (53/106)	6.3% (10/158)	18.9% (27/143)
	12 Fresh sun oil	22.6% (24/106)	5.7% (9/158)	21.0% (30/143)
	13 Best oil	10.4% (11/106)	2.5% (4/158)	7.0% (10/143)
	14 Chefs oil	2.8% (3/106)	0.6% (1/158)	0
	15 Mothers choice	24.5% (26/106)	0	0
	16 King oil	0	0.6% (1/158)	0
	17 Bimoli oil	0	0	3.5% (5/143)
Q3	Of the brands listed ask the stall owner which is the brand most frequently purchased (check the listing)			
	Most frequently purchased commercial package salt brand:	N = 108	N = 160	N = 145
	1 Star salt	88.0% (95/108)	56.9% (91/160)	69.7% (101/145)
	2 Five star salt	0.9% (1/108)	3.7% (6/160)	0
	3 True cook salt	18.2% (11/108)	20.0% (32/160)	17.9% (26/145)
	4 Pacific salt	0	0	0
	5 Jumbo salt	0	10.0% (16/160)	0
	6 Supa salt	0.9% (1/108)	1.9% (3/160)	0
	7 Ezy salt	0	0	9.0% (13/145)
	8 Saxa salt	0	0.6% (1/160)	3.4% (5/145)
	9 Repackaged salt	0	6.9% (11/160)	0
	10 Kakaruk salt	0	0	0
	Most frequently purchased brand of bouillon cubes:	N = 104	N = 110	N = 141
	1 Maggie cubes	22.1% (23/104)	18.2% (20/110)	0
	2 Maggie Kakaruk Stock cubes	77.9% (81/104)	72.7% (80/110)	100% (141/141)
	3 Chicken flavour cubes	0	6.4% (7/110)	0
	4 Super flavor Maggie cubes	0	0.9% (1/110)	0
	5 Beef cubes	0	0	0
	6 Stock cubes	0	1.8% (2/110)	0
	Most frequently purchased brand of Seasoning salt / powder:	N = 15	N = 27	N = 64

1 Teisti Rais	26.7% (4/15)	18.5% (5/27)	3.1% (2/64)
2 Topmi (VE-Tsin)	33.3% (5/15)	0	0
3 Coconut milk powder	26.7% (4/15)	0	0
4 Curry powder	13.3% (2/15)	29.6% (8/27)	81.3% (52/64)
5 Vetgur / Vetzin	0	7.4% (2/27)	0
6 Zesi-1	0	11.1% (3/27)	15.6% (10/64)
7 Maggie	0	33.3% (9/27)	0

Most frequently purchased brand of Seasoning sauce:	N = 4	N = 6	N = 23
1 Soy sauce	75.0% (3/4)	33.3% (2/6)	60.9% (14/23)
2 Mushroom soy sauce	25.0% (1/4)	66.7% (4/6)	34.8% (8/23)
3 Chilli sauce	0	0	0
4 Tomato sauce	0	0	4.3% (1/23)
5 Maggie sauce	0	0	0

Most frequently purchased type of Traditional / Local salt:	N = 0	N = 0	N = 1
1 Ash	0	0	0
2 Rock salt	0	0	100% (1/1)
3 Sea water	0	0	0

Most frequently purchased brand of Wheat flour:	N = 71	N = 81	N = 98
1 Plain flour	73.2% (52/71)	45.7% (37/81)	25.5% (25/98)
2 Flame flour	19.7% (14/71)	14.8% (12/81)	50.0% (49/98)
3 3-Rose flour	5.6% (4/71)	24.7% (20/81)	13.3% (13/98)
4 Whole meal flour	1.4% (1/71)	4.9% (4/81)	10.2% (10/98)
5 Wheat scone flour balls	0	2.5% (2/81)	0
6 Scone flour	0	2.5% (2/81)	0
7 Self-Raising plain flour	0	0	1.0% (1/98)
8 Bakers flour	0	2.5% (2/81)	0
9 Brown wheat bakers flour	0	1.2% (1/81)	0
10 Skai flour	0	0	0
11 Skow flour	0	1.2% (1/81)	0

Most frequently purchased type of wheat flour products:	N = 107	N = 142	N = 145
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	1 dried noodles/macaroni/pasta	0.9% (1/107)	0	0
	2. Instant noodles/2-minute noodles	99.1% (106/107)	100% (142/142)	70.3% (102/145)
	3. Bread/buns/rolls/Crackers/Biscuits	0	0	29.7% (43/145)
	4. Cake/scones/donuts	0	0	0

	Most frequently purchased brand of Rice:	N = 109	N = 138	N = 143
	1 Roots rice	59.6% (65/109)	39.1% (54/138)	10.5% (15/143)
	2 Skel rice	23.9% (26/109)	46.4% (64/138)	74.8% (107/143)
	3 Trukai rice	0	6.5% (9/138)	4.2% (6/143)
	4 Long grain rice	16.5% (18/109)	7.3% (10/138)	0
	5 Star rice	0	0.7% (1/138)	7.7% (11/143)
	6 Wantok rice	0	0	0
	7 Jasmine rice	0	0	0
	8 Ezy cook rice	0	0	0
	9 Super A1 rice	0	0	0.7% (1/143)
	10 Frangipani rice	0	0	1.4% (2/143)
	11 Sun long rice	0	0	0
	12 Ori rice	0	0	0.7% (1/143)
	13 Kumul rice	0	0	0

	Most frequently purchased brand of cooking oils:	N = 106	N = 158	N = 143
	1 Mamas cooking oil	6.6% (7/106)	27.2% (43/158)	11.2% (16/143)
	2 Jumbo oil	0	0.6% (1/158)	0
	3 Vegetable oil	0	10.8% (17/158)	0
	4 Sun shine oil	0	3.2% (5/158)	0
	5 Sunflower oil	0	0.6% (1/158)	0
	6 Flame oil	1.9% (2/106)	22.8% (36/158)	45.4% (65/143)
	7 Patna oil	0	3.8% (6/158)	0
	8 Sun Rise oil	0	0.6% (1/158)	0
	9 Golden Sun oil	40.6% (43/106)	21.5% (34/158)	30.8% (44/143)
	10 Highlands Meadow	0.9% (1/106)	4.4% (7/158)	0
	11 Voila oil	29.2% (31/106)	1.9% (3/158)	7.7% (11/143)
	12 Fresh sun oil	12.3% (13/106)	1.3% (2/158)	2.1% (3/143)

13 Best oil	1.9% (2/106)	0.6% (1/158)	2.1% (3/143)
14 Chefs oil	0.9% (1/106)	0	0
15 Mothers choice	5.7% (6/106)	0	0
16 King oil	0	0.6% (1/158)	0
17 Bimoli oil	0	0	0.7% (1/143)

RESULTS AND INTERPRETATION:

Results for Quantitative Assay of Iodine Content in Various Brands of Salt Collected from Markets in Kerowagi & Sina-Sina, Jimi and Okapa during the Rapid Market Survey in 2022:

This section of the technical report presents the results of the quantitative assay of iodine content in the various brands of salt, salty condiments and flavourings purchased in the various markets in Jimi district in Jiwaka province, Kerowagi and Sina-Sina districts in Simbu province, and Okapa district in EHP.

The information on the enclosed sheets of papers in each of the large zip-locked polythene bags containing a number of smaller zip-locked bags with salt samples, were checked and recorded. The salt samples with (brand names) were collected from markets in Kerowagi & Sina-Sina districts (total of 90 samples), Jimi district (total of 35 samples) and Okapa district (total of 19 samples). In addition, the brands of salt and some flavourings sold in shops and

supermarkets in the National Capital District (NCD) were purchased and analyzed.

The quantitative assay of iodine content in each of the salt samples was carried out, using the WYD Iodine Checker, which is specifically used to measure the iodine content in iodized salt. The iodine was expressed in *parts per million (ppm)* which is equivalent to one *mg of iodine per kilogram of salt (mg/kg)* { $mg/kg = ppm$ }. The WYD iodine checker measures the concentration of iodine in salt iodized with either *Potassium Iodate* or *Potassium Iodide* [12, 13].

The amount of salt used per assay was 1.0g. Proportional amounts of reagents were used for the assay of 0.5 g of salt [12, 13]. Each of the salt samples were analyzed in duplicate.

Calibration of the WYD Iodine checker:

The iodine working standard solution supplied by the manufacturer was used routinely to calibrate the WYD iodine checker used for the analysis. After calibration of the WYD checker, the special Grey Glass supplied with the WYD checker was used

routinely as the internal quality control QC [12, 13].

Internal Quality Control (QC) monitoring:

The internal (bench) QC used for the analysis was the “Westgard” QC system and “Westgard” QC rules. QC Pool Tracking Levy-Jennings Chart, prepared using the Grey Glass, was used for daily routine monitoring of the performance characteristics of the WYD checker. The intra-assay Percent Coefficient of Variation (CV) was 0.9%.

Criteria for Interpretation of the results on salt iodization:

The criteria used for interpretation of the salt iodine results were based on the PNG Salt Legislation [14, 15]. According to the legislation all salt must be iodised with Potassium Iodate; the amount of Iodine in table salt should be 40.0 to 70.0mg/kg (ppm); the amount of Iodine in other salt should be 30.0 to 50.0mg/kg. These levels of Iodine should be present at production or at the point of import.

WHO recommendations for Iodine levels of food grade salt aim to provide 150µg Iodine per day, assume 92% bioavailability, 30% losses from production to household level before consumption [14, 15].

If 30% of Iodine is lost from salt iodised as per PNG Salt Legislation, Iodine content of table salt at the retail or household (HH) level should be between 28.0mg/kg (40mg/kg minus 30%) and 49.0mg/kg (70mg/kg minus 30%). This implies that in PNG the Iodine content in salt in retail outlets or at the time of consumption should be between 28.0mg/kg and 49.0mg/kg.

Some recent publications on salt iodisation in PNG have rounded up the cut-off points by using “30.0 to 50.0mg/kg”. In this report, for the purpose of comparison, the rounded up cut-off points (30.0 to 50.0mg/kg) have been used for presentation of the results. Salt with Iodine levels of less than 5.0 mg/kg is considered non-iodised salt [14, 15].

The format (Table 4) recommended in the recent UNICEF guidelines [14, 15] for the presentation of results on the monitoring of salt iodization programs is used in this report.

RESULTS:

It is important to note that the salt samples were not from the households in the districts, they were collected from the salt sold in the markets.

{NB: Please note that the mean values presented in the results in Tables 4 to 10 have been sorted from lowest to highest}

In the present report the adjusted cut-off points (Table 4) are used to define “Inadequate”, “Adequate” and “Excess”

Iodine in the salt samples. This is important for the purpose of comparing the salt iodine results with other recently published data on salt iodization in PNG [6 - 10].

Salt samples from Kerowagi and Sina-Sina districts Simbu province:

A total of 90 salt samples were received. Seven different salt brands were recorded (Jumbo, 5-Star salt, Super salt, Star salt, Tru-cook salt, Saxa salt, Gold & Black salt). The corresponding iodine content (Mean \pm standard deviation) in the salt from each of the brands are presented in Tables 5. According to the criteria for interpretation of results on salt iodization (Table 4), the iodine content in 18.9% (17/90) of the salt samples was inadequate, 45.6% (41/90) was adequate and 35.5% (32/90) contain excess iodine.

Salt samples from Jimi district Jiwaka province:

A total of 35 salt samples were from Jimi district. Three different salt brands were recorded (Super salt, Star salt, Tru-cook salt). The corresponding iodine content (Mean \pm standard deviation) in the salt from each of the brands of salt are presented in Table 6. The iodine content in 2.9% (1/35) of the salt samples was inadequate, 68.6% (24/35) was adequate and 28.5% (10/35) contain excess iodine.

Salt samples from Okapa district EHP:

Of the 19 salt samples from Okapa, one was traditional salt and 18 were commercial salt samples. Two different salt brands were recorded (Star salt, Tru-cook salt). The corresponding iodine content (Mean \pm standard deviation) in the salt from each of the brands of salt are presented in Table 7. According to the criteria for interpretation of results on salt iodization, for commercial salt, no iodine was in 5.6% (1/18) of the commercial salt samples, iodine content in 94.4% (17/18) of the salt samples was adequate.

Salt samples from National Capital District (NCD):

For the purpose of comparison, the iodine content in the different brands of salt sold in trade stores and supermarkets in NCD were analyzed. There were 20 different brands of salt in NCD. A total of 53 salt samples were purchased and analyzed. The mean iodine content in the salt samples from the different brands is presented in Table 8. Iodine content was below 5.0 mg/kg in 9.4% (5/53) of the salt samples, the iodine content in 20.8% (11/53) of the salt brands was inadequate, 32.1% (17/53) was adequate and 37.7% (20/53) of the salt contains excess iodine.

Table 4: Criteria for interpretation of iodine content in salt [14, 15]

				Percentage (n) of salt with Iodine content		
				Rounded-up cut-off points in PNG Salt Legislation		
Name of district	Name of Provinces	Number of salt	<5.0 mg/kg	Inadequate: 5 – 29.9 mg/kg	Adequate: 30 – 50 mg/kg	Excess: > 50 mg/kg
Kerowagi	Simbu	90	0	18.9% (17/90)	45.6% (41/90)	35.5 (32/90)
Jimi	Jiwaka	35	0	2.9% (1/35)	68.6% (24/35)	28.5% (10/35)
Okapa	EHP	18	5.6% (1/18)	0	94.4% (17/18)	0
NCD		53	9.4% (5/53)	20.8% (11/53)	32.1% (17/53)	37.7% (20/53)

While it is recommended that the definition of “no iodine” be maintained in different settings, the definitions of Inadequate, Adequate, and Excess iodine should be modified based on national standards, which is the PNG Salt Legislation [4, 5]

One of the generally acceptable concepts is that it is better to consume salt containing more iodine than less iodine [1].

A recalculation of the results for Kerowagi and Sina-Sina districts, indicates that the iodine content in 81.1% (73/90) of the salt samples was over 30.0 mg/kg. For Jimi, of the 35 salt samples collected the iodine content in 97.1% (34/35) was over 30.0 mg/kg. For Okapa, of the 18 salt samples collected 94.4% (17/18) contained iodine content over 30.0 mg/kg. For NCD, the iodine content in 69.8% (37/53) of the salt samples was over 30.0 mg/kg.

Flavourings and Seasonings available in shops in National Capital District (NCD):

The different brands of flavourings and seasonings available in trade stores and supermarkets in NCD were also purchased and analyzed. A total of 14 different brands were purchased. The corresponding iodine content (Mean \pm standard deviation) in each brand is presented in Table 9.

There are no acceptable criteria for interpretation of the iodine content in flavourings and seasonings that are added to foodstuffs. However, the results in Table 9, show that the mean iodine content (7.8mg/kg) in the New Maggi Kakaruk stock cube with “Iodized” on the label was about twice the amount (4.5mg/kg) in the regular Maggi Kakaruk cube. The iodine content in the regular Kakaruk salt (6.7mg/kg) was almost twice less than the iodine content in the New Kakaruk salt (11.0mg/kg) with “iodized” on the label.

The flavourings with the highest iodine content was “*Tru-cook good pela taste*” with iodine content of 33.5 mg/kg. This locally produced flavoring is not popular among residents in the NCD.

Table 5: Iodine content in the brands of salt collected from markets in Kerowagi and Sina-Sina districts Simbu province

Salt brands	Number of samples	Mean Iodine content (mg/kg)	Standard Deviation	95% CI (mg/kg)	Range (mg/kg)
Jumbo	22	42.3	12.6	36.7 – 47.9	19.4 – 54.1
5 Star salt	16	39.0	6.8	35.4 – 42.6	30.4 – 57.6
Super salt	24	53.1	4.8	51.1 – 61.5	41.3 – 61.5
Star salt	18	35.3	10.7	30.0 – 40.6	17.1 – 55.5
Tru cook & two others	10	35.4	15.2	26.3 – 44.6	21.1 – 60.7

Table 6: Iodine content in the brands of salt collected from markets in Jimi district Jiwaka province

Salt brands	Number of samples	Mean Iodine content (mg/kg)	Standard Deviation	95% CI (mg/kg)	Range (mg/kg)
Super salt	9	58.8	1.99	57.3 – 60.3	55.5 – 61.0
Star salt	10	43.0	6.51	38.3 – 47.7	30.0 – 54.1
Tru cook & others	16	39.9	4.9	37.3 – 42.5	25.4 – 44.9

Table 7: Iodine content in the brands of salt purchased from markets in Okapa EHP

Salt brands	Number of samples	Mean Iodine content (mg/kg)	Standard Deviation	95% CI (mg/kg)	Range (mg/kg)
Tru Cook	9	37.8	3.93	34.8 – 40.8	31.8 – 43.4
Star salt	9	32.8	11.62	23.9 – 41.7	4.5 – 45.7
Traditional salt	1	2.7	0.8	--	--

Table 8: Iodine content of brand of salt purchased in various stores and supermarkets in NCD

SALT BRAND	Number of samples	Mean Iodine content (mg/kg)	Std Dev	Range (mg/kg)
Super salt	14	64.1	8.98	46.5 – 76.5
Star salt	3	36.2	1.51	35.1 – 37.9
5 Star salt	6	74.6	15.31	63.4 – 96.0
Jumbo salt	1	35.7	0.6	35.3 – 36.1
Tru cook salt	1	29.3	1.2	28.4 – 30.1
Saxa salt	5	15.9	0.57	0.5 – 39.5
Saxa Iodized Table Salt	9	42.9	19.52	27.7 – 92.0
Sazza Fine Salt Iodized Salt	2	14.0	0.55	12.0 – 16.3
Fine Salt	1	0.3	0.1	0.2 – 0.3
Mermaid Table Salt	1	6.8	1.8	5.5 – 8.0
Kakaruk Salt	1	7.8	0.3	7.6 – 8.0
Nature Salt Refined Iodized salt	1	10.0	1.1	9.2 – 10.7
Silver Iodized Free Flow salt	1	17.8	0.7	17.3 – 18.3

Cerebos Iodized Table salt	1	20.5	0.7	20.0 – 21.0
National No.1 Iodized Salt	1	25.0	0.5	24.6 – 25.3
Ezy -Cook Pure Iodized Table Salt	1	37.4	0.9	39.0 – 40.0
Horizon Pure Cooking Iodized Salt	1	43.7	1.3	42.7 – 44.6
Tata Salt	1	46.8	2.2	45.2 – 48.3
Black & Gold	1	49.0	1.4	48.0 – 50.0
Best Choice Table Salt	1	53.5	2.1	52.0 – 55.0

One of the brands of salt (Star salt) was available in the markets in the three provinces and in NCD. The mean iodine content of Star salt in the markets in Kerowagi and Sina-Sina was 35.3 mg/kg, in the markets in Jimi it was 43.0 mg/kg, in Okapa it was 32.8 mg/kg and in NCD it was

36.2 mg/kg. There was no statistically significant difference in the mean iodine content in the Star salt from the markets in the four locations. This may suggest minimal loss of iodine in this brand of salt, which is very popular in the remote communities.

Table 9: Iodine content of some flavorings and seasonings from various shops and supermarkets in NCD

Brand Names	Mean iodine content (mg/kg)	Std Dev
Star fresh	1.1	0.1
Maggi Kakaruk stock cube	4.5	0.2
Packet of seasoning in 2-minutes noodles	6.1	0.7
Kakaruk Maggi Salt	6.7	1.4
Knorr Pork Broth cube	8.0	0.7
Knorr Chicken Broth cube	8.2	0.7
Teisti Rais Beef flavor	11.0	0.8
Maggi Kakaruk Stock Cube (Iodized)	7.8	0.5
Super Chicken Stock Cube	16.8	1.1
Maggi Teisti Raise	16.1	0.8
Maggi 2 Minute Noodle Flavor	10.3	0.8
Kakaruk Salt (Iodized)	11.0	0.7
Star Fresh	0.0	0.0
Tru Cook Good Pela Taste	33.5	1.8

CONCLUSION:

In each of the four districts that participated in this study, the findings show that commercial packaged salt was available in more than 85% of the households. Similarly, over 85% of respondents in the households

were aware of the importance of iodized salt. Stock / bouillon cubes were not popular among the households. Over 75% of the respondents had wheat flour products available in the households within the last seven days. Within the last seven days, rice

was available in over 75% of households. In addition, cooking oil was also available in over 85% of the households within the last seven days.

Salt was available in over 95% of the market stalls in all the three districts assessed. In addition most of the salt available in the market stalls were adequately iodized according to the PNG salt legislation. Unlike in Jimi district, stock / bouillon cubes were available in about 95% of the market stalls in Kerowagi, Sina-Sina and Okapa district. Wheat flour products were available in over 85% of the market stalls in the districts in the three provinces. Different brands of Rice and Cooking Oil were available in about 85% and over 95% respectively of the market stalls in the districts in the three provinces that participated in this study.

The iodine content in over 80%, 97% and 94% of the salt samples purchased from market stalls in Kerowagi and Sina-Sina districts, Jimi district and in Okapa district respectively were adequately iodized according to PNG Standards. These results are better than those obtained for the salt samples purchased from trade stores in the National Capital District that yielded results of only 69.8% of the salt samples meeting the national standard iodization standard of 30.0 mg/kg. The National Capital District is the capital city of PNG.

The availability of about 30 percent of salt that is inadequately iodized in the NCD is a concern that requires action by relevant Government authorities and stakeholders. This is more critical considering that the national capital is highly populated hence the probable effect at population level could be pronounced. One explanation for this discrepancy may be because of the very high number of salt brands available in the NCD. Multi-strategic interventions are required to remedy the situation in the NCD, in particular effective monitoring of the iodine content in the various brands of salt imported and sold in the NCD. Effective implementation of the PNG salt legislation is required to improve the access to and availability of adequately iodized salt in the NCD. Commitments at relevant levels of government are essential for successful implementation of such strategies.

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