ORIGINAL ARTICLE

Coverage of the Vaso de Leche and Qali Warma programs among children under five years of age and their associated factors

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ABSTRACT

Objective: To estimate the coverage of being a beneficiary of the Vaso de Leche (VDL – Glass of Milk) and Qali Warma (QW – Vigorous Child) programs among children under five years of age and to determine the associated factors. **Materials and methods:** This study used a secondary source, based on the 2022 Encuesta Demográfica y de Salud Familiar (ENDES – Demographic and Family Health Survey) in Peru. For this purpose, women aged 15 to 49 years with children under five of age and complete anthropometric data were selected to answer questions about being a beneficiary of the VDL and QW programs. The dependent variable was being or not a beneficiary of the programs, and the rate of beneficiaries was compared across levels of the independent variables. A log-binomial regression model within the family of generalized linear models was used for the multivariate analysis, with a significance level of 5 %. **Results:** Among children under five years of age, the rate of beneficiaries of the VDL program was 34.13 %, while that of the QW program was 85.88 %. Variables associated with being a beneficiary of the VDL program included being ≥ 12 months, birth weight < 2,500 g, maternal educational level, belonging to the poorest quintiles and rural residence. The factors associated with being a beneficiary of the QW program included rural residence and belonging to the poor and poorer quintiles. There was no association between being a beneficiary of the QW (aPR: 1.01; 95 % CI: 0.97-1.05) and VDL (aPR: 1.02; 95 % CI: 0.97-1.07) programs and being a child with chronic malnutrition at the time of the survey. **Conclusions:** The coverage of the VDL and QW programs differs significantly and varies according to sector. Being from the poorest quintile and living in rural areas were common correlates across both programs. Nevertheless, these programs also benefited children who were not necessarily in socioeconomically disadvantaged conditions, suggesting issues in the implementation of the intended objectives.

Keywords: Food Assistance; Social Programs; Child, Preschool; Infant; Health Surveys; Peru (Source: MeSH NLM).

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INTRODUCTION

In Peru, supplementary feeding programs are part of the Plan Nacional de Seguridad Alimentaria y Nutricional (National Food and Nutrition Security Plan), whose objective is to guarantee access to nutritious food, preferably to all individuals in situations of vulnerability or poverty [1]. As part of this national strategy, two programs stand out: Glass of Milk (VDL) and Programa Nacional de Alimentación Escolar Qali Warma (Qali Warma [QW – Vigorous Child] National School Feeding Program). The former prioritizes children from zero to six years of age, pregnant and breastfeeding mothers, as well as children aged 7–13 years, older adults, and individuals with tuberculosis [2]. The latter is designed to provide support to children in early childhood education, starting at three years of age, as well as to those in primary and secondary levels of public educational institutions in Peru [3].

Ensuring nutritious food for children under five years of age is crucial. The dietary intake of preschool-aged children at home may be affected by unfavorable socioeconomic conditions [4]. However, the educational environment should be considered to understand their dietary quality. It has been shown that a poor heart-healthy diet is provided without differences between the home and educational institutions [5]. Exposure of children under five to food insecurity increases the risk of developing unhealthy eating habits in adulthood [6]. It also raises the risk of cardiovascular diseases, particularly among adult males [7].

Food security seeks to guarantee this right through the consumption of quality products, in order to reduce inequality in access to food among population subgroups [8]. In Peru, in 2021, 61.4 % of VDL users were under six years of age, half of whom lived in rural areas [9]. On the other hand, 50.6 % of children aged 3–11 years who attended a public school benefited from the QW program [10], and of these, 73.1 % lived in rural areas [11]. These figures reflect that an equitable distribution may not be being achieved throughout the target population, including children aged five years and younger, for whom promoting food security is fundamental.

Several studies have been carried out to verify the proper targeting of these programs. In 2003, a study based on data from the Encuesta Nacional de Hogares (ENAHO – National Household Survey) characterized the VDL program and found that 27 % of beneficiaries were non-poor, while 36 % of extremely poor households were not beneficiaries [12]. In 2018, a study described the VDL beneficiary population of the Municipality of San Ignacio (Cajamarca) and found that 52 % had economic resources [13].

A similar issue is observed in the QW program. In 2017, a study evaluated its implementation in a district of Cusco and found that the percentage of coverage was not assessed, nor was the level of school attendance and permanence recorded, making it unclear whether coverage was adequate [14]. Likewise, data from the ENAHO from 2015 to 2018 show that QW had a positive impact on the health of beneficiary children, but that the effect was not observed in poor children [15].

The purpose of both programs is to provide food assistance to target populations and, therefore, strict control over beneficiaries and the food distribution process must be ensured at the national level. This raises the following questions: What are the main characteristics that determine whether a child under five years of age becomes a beneficiary of the VDL and QW programs? And, at the national level, under routine conditions, are these programs reaching their target group, specifically children under five? In view of this issue, this study attempts to determine the proportion of children under five years of age who are beneficiaries of the VDL and QW programs based on some sociodemographic characteristics, using data from the 2022 Encuesta Demográfica y de Salud Familiar (ENDES – Demographic and Family Health Survey) in Peru.

MATERIALS AND METHODS

Study design and population

We conducted a secondary source study based on the ENDES carried out in Peru between January and December 2022. This had a two-stage probabilistic sampling design, with representative estimates of the population of Peru: its 24 departments and the constitutional province of Callao, urban and rural areas and natural regions (Metropolitan Lima, the rest of the Coast, the Highlands and the Jungle). Of the 38,105 selected women aged 12–49 years, 35,787 completed the interview (response rate: 93.9 %); and of the 22,424 children aged five years or younger selected for anthropometric data measurement, 21,995 were evaluated (response rate: 98.1 %).

The ENDES targeted women aged 12– 49 years and their children aged five years or younger who were residents of the selected household. It also included those women that stayed overnight in the dwelling the night before the day of the interview, even if they were not usual residents. In our study, the inclusion criteria were the following: 1) woman aged 15–49 years living with a child aged five years or younger, 2) child with comprehensive anthropometric data measurement, and 3) mothers who answered the questions aimed at identifying the coverage of the VDL (subsample 1) and QW (subsample 2) programs. Based on the last selection criterion, two study groups were defined.

Coverage of supplementary feeding programs

The ENDES includes a section on food assistance programs aimed at determining the access of beneficiaries to any social food or nutrition assistance program, considering at least one household member. The (female) interviewer asks these questions to the woman, who, in the case of this study, is the mother of children under five years of age.

For our analysis, the 2022 ENDES collected information using two questions for each program: 1) Does any member of your household receive food or nutrition assistance from the VDL social program? (variable QH101), and 2) Does (NAME) receive breakfast and/or lunch at school from the QW national school feeding program? (variable PS109_1R). Responses were collected using the following categories: *yes*, *no*, and *does not know/does not remember*. For the purposes of this study, each variable was recategorized into a dichotomous variable (*yes* or *no*). There were no participants who responded *does not know/does not remember*.

Variables and measurements

We examined three groups of variables to characterize the coverage of the QW and VDL programs. Within the *characteristics of the child*, we included *sex* (variable B4), measured as *male* or *female*; *age* (variable HC1), measured in months (and recategorized into *0–11*, *12–35* and *36–59 months*); *prenatal checkups* (variable M14), corresponding to the number of checkups and a *does not know* option, recategorized as *no checkups*, *1–5* and ≥ *6 checkups* (responses marked as *does not know* were treated as missing data) [16]; *term birth*, measured as *yes* or *no* based on the variable *duration of pregnancy*

(variable QS220A) (considered *yes* when the duration was nine months); *cesarean birth* (variable M17), measured as *yes* or *no*; and *birth weight* (variable M18), measured in grams, which also included the categories *not weighed at birth* and *does not know* (it was recategorized into three groups: < *2,500 g*, *2,500 to* < *4,000 g*, and ≥ *4,000 g*; responses of *not weighed at birth* and *does not know* were treated as missing data.

The ENDES defined chronic malnutrition in children as a condition affecting children under five years of age who had a height-for-age Z-score (variable HW70) less than -2 standard deviations (< -2 SD) from the median, according to the child growth standards established by the World Health Organization (WHO). The categories were the following: no malnutrition (HW70 ≥ -2 SD), moderate malnutrition (-3 SD ≤ HW70 < -2 SD) and severe malnutrition (HW70 < -3 SD). The variable was later recategorized dichotomously (presence or absence). The procedures and materials used for measuring height are detailed in the manuals for anthropometrists and interviewers [17,18]. The anthropometrists were previously trained in anthropometric techniques in accordance with the national technical standard [19].

The second group of variables were the *characteristics of the mother*: *educational level* (variable V106), recategorized into *no education-primary*, *secondary* and *higher*; *age* (variable V012), measured in years, which, according to the inclusion criteria, was recategorized into three groups: *15-24*, *25-34*, and *35-49*; *marital status* (variable V501), measured with the categories *married*, *living together*, *never married*, *widowed*, *divorced*, *not living together*, which was then recategorized into *in a union* (married, living together) and *not in a union* (for the other categories); *current work status* (variable V714), measured as *working* or *not working*; *maternal ethnicity* (variable V131), recategorized as *no* when the response was *Spanish*, *Portuguese* or *other foreign language*, and *yes* for the other categories.

The third group of variables consisted of the *characteristics of the household* and included *area of residence* (*urban* or *rural*); *wealth index* in quintiles with the categories *poorer*, *poor*, *middle class*, *rich*, *richer*; and *department*, which included the 24 departments and one constitutional province as response categories. The variables identified were selected according to a review of the literature [20-23].

The ENDES collects information on the specified variables through face-to-face interviews conducted in selected households. The data were recorded using a computer application by the interviewer and the anthropometrist, both of whom are health professionals.

Statistical analysis

Given the complex sampling design of the ENDES, we applied the variables V001 (cluster), V022 (stratum), and V005 (female weighting factor), the latter divided by 1,000,000 to obtain the sample weight.

We conducted the analysis on two subsamples defined by the inclusion criteria using the svy command of the Stata program, version 16. Each subsample consisted of children aged five years or younger with comprehensive anthropometric data, whose mothers were interviewed and received complete information about the VDL or QW program.

A descriptive analysis was conducted for each defined subsample, estimating the weighted proportion, standard error (SE) and 95 % confidence interval (95 % CI) of the coverage of each program, as well as the characterization according to the study variables. Additionally, to explore the ecological-level independence in the departmental implementation of both programs, we performed a correlation analysis using Spearman's Rho coefficient, taking as data the weighted proportions by department of the VDL and QW coverage.

In the bivariate analysis, the dependent variable was considered to be a beneficiary or not of the social program. The proportion of being a beneficiary was compared across strata of the independent variables using the Pearson's chi-square test with second-order Rao-Scott correction. This analysis was performed for each subsample of the study.

A multivariate analysis was conducted using a log-binomial regression model within the family of generalized linear models [24]. This model uses a log link function to relate a binary outcome variable—being or not being a beneficiary of a social program—to a set of explanatory variables, which in this analysis were those selected to characterize program coverage. This model allows an unbiased estimation of adjusted prevalence ratios based on a range of explanatory variables for a common outcome (> 10 %) [24].

We formulated two models, one for each social supplementary feeding program. In the bivariate analysis, we selected independent variables that reached a p value < 0.20 (two-tailed). All covariates were entered simultaneously into each model. The absence of multicollinearity was assessed by assessing the SE of the regression coefficient of each variable. Standard errors greater than 2.0 were indicative of multicollinearity between the independent variables [25].

The strength of association between the dependent and independent variables was estimated with an adjusted prevalence ratio. Point estimates were presented with 95 % CI. A statistically significant association was considered when the CI did not include the value of 1.

Ethical considerations

The ENDES database is anonymized and freely available through the INEI portal. Prior to the analysis, the study protocol was approved by the Institutional Review Board (IRB) of the Universidad de Piura (UDEP).

RESULTS

After applying our selection criteria, the study population was divided into two subsamples: subsample 1 (VDL) consisting of 21,923 children, and subsample 2 (QW), consisting of 4,870 (Figure 1).

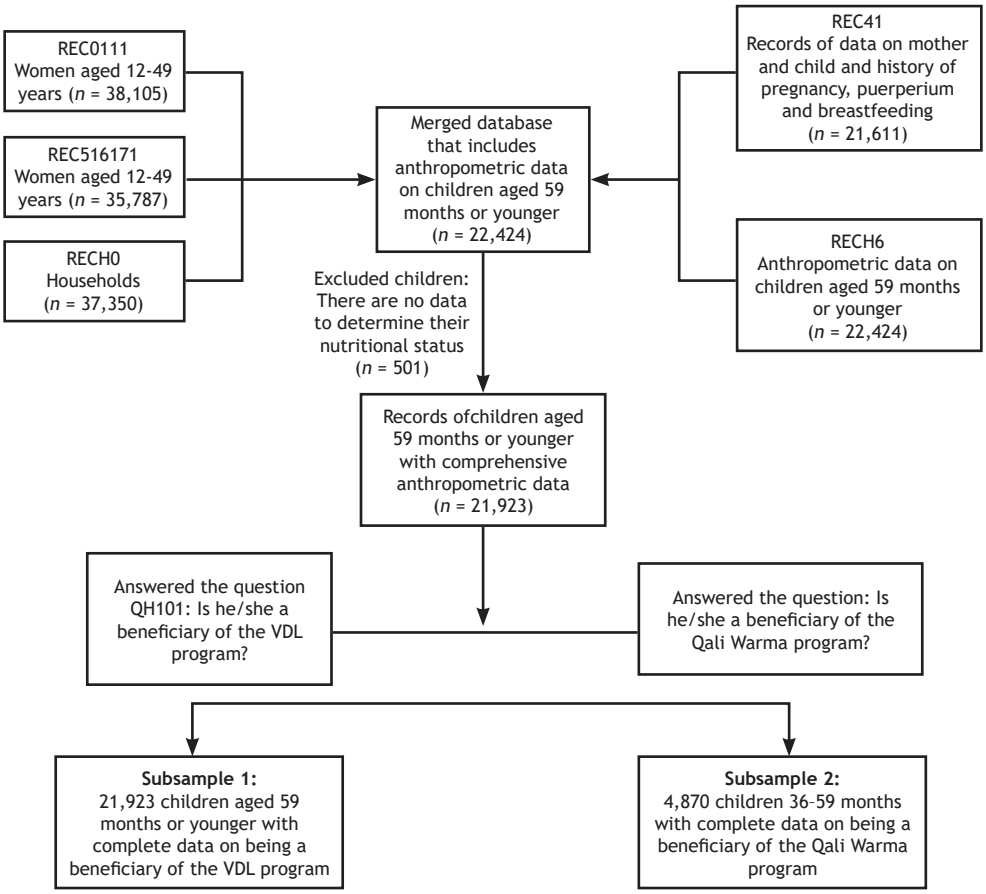

Figure 1. Flowchart of participant selection for the analysis
CMC: chronic malnutrition in children, PS: social program, VDL: Vaso de Leche (Glass of Milk).

Description of coverage

Among children under five years of age, the proportion of participants benefiting from the VDL program was 34.13 % (Table 1), while in QW it was 85.88 % (Table 2). These percentages at the departmental level show that, for VDL, the departments with the highest proportion of beneficiary children were Callao (73.46 %), Huancavelica (69.05 %), Amazonas (60.42 %), Cajamarca (60 %) and Puno (55.90 %). In the QW program, the departments with the highest coverage were Tumbes (99.06 %), Amazonas (98.95 %), Moquegua (97.49 %), San Martín (96.07 %) and Pasco (95.94 %) (Table 1). We did not find a linear correlation between the weighted proportions of the programs (Spearman's Rho = 0.138; p = 0.508).

Among children under five years of age with valid responses to the question about VDL, 51.97 % were male, 42.65 % were 36–59 months old, and 86.04 % had a birth weight of 2,500–3,999 g. Among those with valid responses to the question about QW, 51.20 % were male and 85.86 % had a birth weight of 2,500–3,999 g. The most important characteristics found in mothers who provided valid responses about VDL and QW were being aged 25–34 years (48.79 % in VDL; 49.06 % in QW) and having a high school education level with 48.42 % in VDL and 48.73 % in QW (Tables 1 and 2).

Table 1. Characteristics of children under five years of age with valid responses to the question about being a beneficiary of the VDL program (*N* = 21,913)

Variable	*n*	Weighted proportion (%)	Confidence Interval (95 %)		SE
			LL	*UL*	
Receives the VDL program					
Yes	8,084	34.13	33.37	34.89	0.39
No	13,829	65.87	65.11	66.63	0.39
Characteristics of the child					
Sex of the child					
Male	11,334	51.97	51.14	52.79	0.42
Female	10,589	48.03	47.21	48.86	0.42
Age (months)					
0-11	4,027	18.21	17.59	18.86	0.32
12-35	8,595	39.14	38.34	39.94	0.41
36-59	9,301	42.65	41.84	43.47	0.42
Prenatal checkups (*n* = 18,329)					
No checkups	177	0.89	0.75	1.05	0.08
1-5	2,255	13.18	12.57	13.82	0.32
≥ 6	15,897	85.93	85.28	86.56	0.33
Term birth (*n* = 20,852)					
No	3,858	20.44	19.75	21.15	0.36
Yes	16,994	79.56	78.85	80.25	0.36
Cesarean birth (*n* = 20,852)					
No	13,985	64.28	63.45	65.10	0.42
Yes	6,867	35.72	34.90	36.55	0.42
Birth weight (g) (*n* = 20,255)					
< 2,500	1,261	6.16	5.77	6.58	0.21
2,500-3,999	17,414	86.04	85.43	86.62	0.30
4,000	1,580	7.80	7.34	8.28	0.24
Characteristics of the mother					
Maternal age (years)					
15-24	4,550	21.49	20.81	22.18	0.35
25-34	10,164	48.79	47.95	49.64	0.43
35-49	6,128	29.72	28.95	30.50	0.39
Maternal educational level (*n* = 20,852)					
No education - primary	3,925	18.18	17.58	18.80	0.31
Secondary	10,330	48.42	47.58	49.27	0.43
Higher	6,597	33.39	32.58	34.22	0.42
Maternal union (*n* = 20,852)					
Not in a union	3,569	17.35	16.72	18.00	0.33
In a union	17,283	82.65	82.00	83.89	0.33

Variable	*n*	Weighted proportion (%)	Confidence Interval (95 %)		SE
			LL	*UL*	
Mother ethnicity (*n* = 20,852)					
No	18,634	92.08	91.70	92.45	0.19
Yes	2,218	7.92	7.55	8.30	0.19
Mother currently working (*n* = 20,852)					
No	9,238	43.93	43.09	44.77	0.43
Yes	11,614	56.07	55.24	56.91	0.43
Characteristics of the household					
Area or residence					
Urban	14,750	72.40	71.72	73.07	0.34
Rural	7,173	27.60	26.93	28.28	0.34
Wealth index (*n* = 20,852)					
Poorer	6,533	27.46	26.76	28.16	0.36
Poor	5,631	24.38	23.68	25.09	0.36
Middle class	4,089	20.12	19.43	20.82	0.35
Rich	2,808	16.22	15.55	16.90	0.34
Richer	1,791	11.83	11.23	12.46	0.31

95 % CI: confidence interval, *LI*: lower limit, *UL*: upper limit, SE: standard error.

Table 2. Characteristics of children aged three to five years with valid responses to the question about being a beneficiary of the QW program (*N* = 4,870)

Variable	*n*	Weighted proportion (%)	Confidence interval (95 %)		SE
			LL	*UL*	
Receives the QW program					
Yes	4,359	85.88	84.47	87.18	0.69
No	511	14.12	12.82	15.53	0.69
Characteristics of the child					
Sex of the child					
Male	2,487	51.20	49.46	52.95	0.89
Female	2,383	48.80	47.05	50.54	0.89
Prenatal checkups (*n* = 3,484)					
No checkups	14	0.39	0.22	0.71	0.12
1-5	298	9.36	8.20	10.67	0.63
≥ 6	3,172	90.25	88.93	91.43	0.64
Term birth (*n* = 4,570)					
No	760	19.04	17.61	20.56	0.75
Yes	3,810	80.96	79.44	82.40	0.75
Cesarean birth (*n* = 4,570)					
No	3,219	68.03	66.27	69.75	0.89
Yes	1,351	31.97	30.25	33.73	0.89

Variable	*n*	Weighted proportion (%)	Confidence interval (95 %)		SE
			LL	*UL*	
Birth weigth (g) (*n* = 4,452)					
< 2,500	286	6.50	5.65	7.46	0.46
2,500-3,999	3,801	85.86	84.54	87.09	0.65
4,000	365	7.64	6.73	8.66	0.49
Characteristics of the mother					
Maternal age (years) (*n* = 4,570)					
15-24	767	16.64	15.36	18.01	0.68
25-34	2,267	49.06	47.25	50.86	0.92
35-49	1,536	34.31	32.60	36.05	0.88
Maternal educational level (*n* = 4,570)					
No education-primary	996	22.23	20.81	23.71	0.74
Secondary	2,269	48.73	46.92	50.54	0.92
Higher	1,305	29.05	27.39	30.77	0.86
Maternal union (*n* = 4,570)					
Not in a union	851	19.13	17.72	20.63	0.74
In a union	3,719	80.87	79.37	82.28	0.74
Maternal ethnicity (*n* = 4,570)					
No	4,039	90.98	90.08	91.79	0.44
Yes	531	9.03	8.21	9.92	0.44
Mother currently working (*n* = 4,570)					
No	1,700	37.89	36.15	39.67	0.90
Yes	2,870	62.11	60.33	63.86	0.90
Characteristics of the household					
Area of residence					
Urban	3,132	68.17	66.61	69.68	0.78
Rural	1,738	31.83	30.32	33.39	0.78
Wealth index					
Poorer	1,527	30.67	29.12	32.27	0.80
Poor	1,329	27.78	26.20	29.41	0.82
Middle class	923	20.64	19.18	22.19	0.77
Rich	541	13.58	12.31	14.96	0.67
Richer	250	7.33	6.30	8.52	0.57

95 % CI: confidence interval, *LL*: lower limit, *UL*: upper limit, SE: standard error

Factors associated with receiving Vaso de Leche and Qali Warma

In the bivariate analysis, all variables were associated with being a beneficiary of the VDL program, except for sex. The proportion of beneficiaries among boys (34.42 %) and girls (33.82 %) did not show significant differences (Table 3). On the other hand, the variables associated with being a beneficiary of the QW program were term birth ($p < 0.005$), cesarean birth ($p < 0.001$), chronic malnutrition of child ($p < 0.001$), maternal age ($p = 0.021$), maternal educational level ($p < 0.001$), maternal ethnicity ($p < 0.001$), area of residence ($p < 0.001$) and wealth index ($p < 0.001$) (Table 3).

Table 3. Bivariate analysis of factors associated with receiving VDL and QW in children under five years of age in 2022

Variable	Proportion of children who are beneficiaries of VDL					Proportion of children who are beneficiaries of QW				
	n	Weighted proportion (%)	*LL*	*UL*	*p* value[a]	*n*	Weighted proportion (%)	*LL*	*UL*	*p* value[a]
Characteristics of the child										
Sex of the child										
Male	11,328	34.42	33.37	35.48	0.440	2,487	85.07	82.99	86.94	0.231
Female	10,585	33.82	32.74	34.92		2,383	86.72	84.77	88.47	
Age (months)										
0-11	4,024	31.21	29.52	32.97	0.001	0	0	0	0	
12-35	8,589	35.15	33.93	36.38		0	0	0	0	
36-59	9,300	34.44	33.28	35.61		4,870	85.88	84.47	87.18	
Prenatal checkups										
No checkups	177	39.92	31.63	48.62	0.033	14	74.20	37.83	93.15	0.224
1-5	2,255	30.78	28.52	33.12		298	82.16	75.19	87.49	
6 and older	15,889	33.37	32.27	33.91		3,172	86.28	84.55	87.84	
Term birth										
No	3,857	28.54	26.88	30.27	< 0.001	760	81.43	77.42	84.86	0.005
Yes	16,985	35.41	34.54	36.28		3,810	86.70	85.12	88.13	
Cesarean birth										
No	13,976	39.16	38.18	40.14	< 0.001	3,219	87.86	86.19	89.35	< 0.001
Yes	6,866	24.73	23.51	25.99		1,351	81.09	78.08	83.77	
Birth weight (g)										
< 2500	1,261	38.80	35.63	42.06	< 0.001	286	83.17	76.53	88.22	0.680
2,500-3,999	17,406	33.91	33.07	34.77		3,801	85.63	84.00	87.11	
4,000	1,578	24.74	22.22	27.46		365	86.21	80.28	90.57	
Chronic malnutrition in children										
No	6,580	31.87	31.07	32.67	< 0.001	3,883	85.16	83.62	86.57	< 0.001
Yes	1,504	51.18	48.98	53.37		476	92.17	88.88	94.54	
Characteristics of the mother										
Maternal age (years)										
15-24	4,549	37.35	35.68	39.06	< 0.001	767	89.60	86.22	92.23	0.021
25-34	10,157	33.58	32.47	34.70		2,267	85.81	83.69	87.69	
35-49	6,126	32.28	30.89	33.71		1,536	83.64	80.90	86.05	
Maternal educational level										
No education -primary	3,925	53.88	52.05	55.69	< 0.001	996	91.99	89.58	93.89	< 0.001
Secondary	10,325	37.51	36.38	38.66		2,269	85.76	83.61	87.68	
Higher	6,592	18.07	16.96	19.25		1,305	80.76	77.59	83.57	
Maternal union										
Not in a union	3,566	31.29	29.47	33.17	0.002	851	85.68	82.02	88.69	0.991
In a union	17,276	34.57	33.72	35.43		3,719	85.70	84.07	87.19	

Variable	Proportion of children who are beneficiaries of VDL					Proportion of children who are beneficiaries of QW				
	n	Weighted proportion (%)	*LL*	*UL*	*p* value[a]	*n*	Weighted proportion (%)	*LL*	*UL*	*p* value[a]
Mother ethnicity										
No	18,624	31.66	30.85	32.47	< 0.001	4,039	84.75	83.15	86.21	< 0.001
Yes	2,218	61.28	58.87	63.64		531	95.26	92.30	97.12	
Mother currently working										
No	9,236	36.14	34.95	37.34	< 0.001	1,700	87.00	84.65	89.03	0.156
Yes	11,606	32.33	31.32	33.36		2,870	84.90	82.97	86.65	
Characteristics of the household										
Area of residence										
Urban	14,741	22.50	21.68	23.35	< 0.001	3,132	81.22	79.28	83.03	< 0.001
Rural	7,172	64.61	63.31	65.89		1,738	95.84	94.60	96.81	
Wealth index										
Poorer	6,532	62.66	61.27	64.03	< 0.001	1,527	94.23	92.57	95.53	< 0.001
Poor	5,625	36.33	34.79	37.91		1,329	86.85	84.14	89.15	
Middle class	4,087	23.59	21.97	25.29		923	81.85	78.09	85.10	
Rich	2,808	13.59	12.10	15.23		541	78.21	73.37	82.38	
Richer	1,790	8.35	6.84	10.15		250	70.34	62.21	77.35	

95 %: CI confidence interval, *LL*: lower limit, *UL*: upper limit.
[a] Pearson's chi square test with second-order Rao-Scott correction.

Variables that reached a *p* value less than 0.20 entered the log-binomial regression model. Among children aged five years or younger with a valid response to the question about the VDL program we found that those with a birth weight < 2,500 g had a 22 % higher probability of being beneficiaries of the program compared to those with a birth weight ≥ 4,000 g (95 % CI: 1.07–1.38). Additionally, we found that children from households with the "poorer" wealth index had 4.28 times the probability of being beneficiaries of the VDL program compared to children from households with the "richer" wealth index (95 % CI: 3.46–5.30). Children living in rural areas had a 66% higher probability of being beneficiaries of the VDL program (95 % CI: 1.57–1.75) (Table 4).

In the group of children under five years of age with a valid response to the QW program, the independently associated factors were residing in rural areas (aPR = 1.12, 95 % CI: 1.08–1.16) and belonging to the poorer (PR = 1.20, 95 % CI: 1.07-1.36) and poor (aPR = 1.19, 95 % CI: 1.0 6–1.34) quintiles compared to the richer.

Table 4. Log binomial regression analysis to evaluate the association between being a beneficiary of supplementary feeding programs and variables to characterize coverage in children under five years of age

Variables	Being a beneficiary of the VDL program [a]				Being a beneficiary of the QW program [b]			
	aPR	95 % CI (*LL – UL*)		*p* value	aPR	95 % CI (*LL - UL*)		*p* value
Characteristics of the children								
Age (months)								
0–11	1							
12–35	1.15	1.08	1.23	< 0.001				
36–59	1.15	1.08	1.22	< 0.001	-	-	-	-
Birth weight (g)								
< 2,500	1.22	1.07	1.38	0.002	-	-	-	-

Variables	Being a beneficiary of the VDL program [a]				Being a beneficiary of the QW program [b]			
	aPR	95 % CI (*LL – UL*)		*p* value	aPR	95 % CI (*LL - UL*)		*p* value
2,500 - 3,999	1.18	1.07	1.31	0.002				
≥ 4,000	1				-	-	-	-
Chronic malnutrition								
No	1				1			
Yes	1.02	0.97	1.07	0.492	1.01	0.97	1.05	0.712
Characteristics of the mother								
Maternal age (years)								
15-24	1				1			
25-34	1.10	1.04	1.16	0.001	0.98	0.94	1.02	0.384
35-49	1.08	1.02	1.15	0.014	0.96	0.92	1.01	0.108
Educational level								
No education- primary	1.25	1.15	1.35	< 0.001	1.01	0.96	1.07	0.601
Secondary	1.27	1.18	1.36	< 0.001	0.99	0.94	1.04	0.658
Higher	1				1			
Maternal union								
In a union	1				-	-	-	-
Not in a union	1.02	0.96	1.08	0.603	-	-	-	-
Maternal ethnicity								
No	1				1			
Yes	1.04	1.00	1.09	0.077	1.01	0.98	1.05	0.402
Mother currently working								
No	1.02	0.97	1.08	0.451	1.02	0.99	1.05	0.239
Yes	1				1			
Characteristics of the household								
Area of residence								
Urban	1				1			
Rural	1.66	1.57	1.75	< 0.001	1.12	1.08	1.16	< 0.001
Wealth index								
Poorer	4.28	3.46	5.30	< 0.001	1.20	1.07	1.36	0.002
Poor	3.37	2.74	4.16	< 0.001	1.19	1.06	1.34	0.003
Middle class	2.51	2.03	3.11	< 0.001	1.15	1.03	1.30	0.018
Rich	1.54	1.23	1.94	0.001	1.11	0.98	1.25	0.101
Richer	1				1			

95 % CI: confidence interval, *LL*: lower limit, *UL*: upper limit, aPR: adjusted prevalence ratio.
[a] Analysis of the VDL program adjusted to the following variables: child age, birth weight, chronic malnutrition, maternal age, maternal educational level, maternal union, maternal ethnicity, mother currently working, area of residence and wealth index.
[b] Analysis of the QW adjusted for the following variables: chronic malnutrition, maternal age, maternal educational level, maternal ethnicity, mother currently working, area of residence and wealth index.
The standard error was less than (SE < 1.0) in the analysis. The statement applies to both models.

DISCUSSION

Among children under five years of age participating in the 2022 Peruvian ENDES, the estimated coverage of the QW program was 85.88 %, much higher than that found for the VDL program (34.13 %). This finding is explained by the different eligibility criteria for each program. The QW program distributes breakfasts and/or lunches to the public schools [3,26] across the country. Therefore, only children who attend public schools receive the rations, and this generates a high level of selectivity [27]. On the other hand, the VDL program delivers one daily ration, through the municipalities, only to those families that belong to a poor and very poor wealth quintiles [12].

A noteworthy finding is that 13.59 % of children from families that, according to the wealth index, were "rich" and 8.35 % from "richer" families were beneficiaries of the VDL program. This result is consistent with reports from the ENAHO, which suggest that the VDL program may be reaching a population that is not considered poor [28,29]. In fact, in 2022, out of 993,798 beneficiary households, 58.8 % were not in poverty [29]. Despite the shortcomings the VDL program faces in defining its intended population, we found that, independently of other factors, belonging to the poorest wealth quintiles was progressively associated with a higher probability of being a beneficiary. A similar dose–response effect was observed in the QW program, although with weaker associations.

Another aspect that helps explain why there are beneficiaries of the VDL program from the rich or very rich quintiles is that its rations are distributed to municipalities, which are responsible for identifying those in poverty. For this purpose, municipalities rely on the information provided by the Sistema de Focalización de Hogares (Sisfoh – Household Targeting System), whose role is to manage the Padrón General de Hogares (PGH – General Household Registry) based on socioeconomic status [9]. In addition, the validity of the socioeconomic classification can last between four and eight years, depending on the area of residence [31], which may affect the updating of data and, therefore, the adequate targeting of the program.

At the departmental level, children under five years of age have variable access to VDL and QW. For VDL, the departments that achieved coverage of at least 60 % were Amazonas, Cajamarca, Callao and Huancavelica. For QW, several departments achieved coverage above 95 %, for example, Amazonas, Ica, Loreto, Moquegua, Pasco, San Martin and Tumbes. The coverages of both programs were not linearly correlated at the ecological level, which evidenced their differences in eligibility criteria, logistical limitations, as well as implementation and administration mechanisms, both at the national and departmental levels.

We found that, among children under five years of age with chronic malnutrition, 51.18 % were beneficiaries of VDL, while among children aged three to five years with chronic malnutrition, 92.17 % were beneficiaries of QW. The analysis adjusted to evaluate whether there was an association between chronic malnutrition in children and being a beneficiary of these programs did not reveal statistical significance. The explanation for this finding is based on the fact that one of the main causes of chronic malnutrition in children is food insecurity, which is the result of other variables, such as wealth index, area of residence and parental education [31]. Therefore, controlling for these factors, the initially observed association between chronic malnutrition in children and being a beneficiary of VDL and QW disappears. The occurrence of chronic malnutrition in children before becoming beneficiaries in any of the analyzed programs is also plausible.

We also found that being a beneficiary and living in rural areas had a stronger association for the VDL program than for QW (aPR = 1.66 vs. aPR = 1.12). This is explained by the fact that the area of residence —rural or urban— is associated with the household income. While VDL is distributed according to the poverty status of the target population, QW covers public schools located in the districts of each department, regardless of the socioeconomic context of each sector in which they are located.

Children of mothers with no education or only primary education had a 25 % higher probability of being beneficiaries of VDL compared to those with mothers with higher education; this association was not observed in QW. Although both programs aim to provide supplementary feeding to vulnerable populations, VDL specifically targets those living in poverty. Higher educational attainment protects women from socioeconomic conditions characterized by low income and, in the long term, reduces the probability of belonging to lower wealth quintiles, which leads to a lower probability of being part of the target population of the VDL program.

The study has limitations. First, being a study based on secondary data sources relying on mothers' reports, it is susceptible to social desirability bias. Second, due to the cross-sectional design, it is not possible to establish a causal relationship between the variables studied and being a beneficiary of these social programs; moreover, this study was not designed to assess the impact of these programs on chronic malnutrition in children. Third, there may be covariates of interest that were not included in our analysis and that influence beneficiary status under real-life conditions. Fourth, being a cross-sectional study, it does not evaluate beneficiary status over the course of the year, during which there may be variations in this status. Finally, our study is limited to a population of children aged five years and under; consequently, the results cannot be extrapolated to the entire beneficiary population of VDL and QW.

Despite the limitations described, the strength of this study was to review the literature related to the research topic [20-23] to guide the analysis of the variables associated with being a beneficiary of these programs. Also, it is a first attempt to describe, using data from a population-based survey, the proportion of preschool children who received assistance from VDL and QW.

In conclusion, among children under five years of age, belonging to the poorer and poor wealth quintiles is one of the characteristics most strongly associated with being a beneficiary of the VDL and QW programs. However, the children who receive support from the VDL program are not necessarily in socioeconomically vulnerable conditions, which suggests issues in the implementation of its objectives. When considering as the denominator the children of mothers who provided valid responses to the questions about receiving assistance from the VDL and QW, both programs showed markedly different national coverage rates, with considerable heterogeneity at the departmental level.

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