

Kagera Health and Development Survey: Price Index

i. Introduction

Price data were collected in each KHDS wave. In all four waves of 1991-94 and in 2004, the price questionnaire was administered in each baseline community. In 2010, the price questionnaire was a part of the Household Questionnaire and was administered in each household. As a result, KHDS-2010 contains price information also for other regions than Kagera.

The 2010 price index corrects prices both temporally and spatially. The table 1 gives an overview of the price correction strategy for 2004 and 2010 households.

Table 1: Price corrections per location of 2004 and 2010 households

Location	Price Correction	
	Temporal	Spatial
Original cluster or nearby	Cluster level Fisher Ideal Index	Spatial Fisher Index = 1
Elsewhere in Kagera	Fisher Ideal Index of the nearest cluster	Spatial Fisher Index = 1
Another Region in Tanzania	Kagera inflation rate between surveys	Spatial Fisher Index from KHDS 2010
Uganda	Kagera inflation rate between surveys	Exchange rate

ii. Households living in or near the original cluster

Each KHDS cluster has six price questionnaires; one in each of the four waves in 1991-1994 and one in 2004. For 2010, the price data are constructed from the price information reported by the households residing in these clusters.

Prices across waves are corrected using Fisher Ideal Index. The base price for the Fisher Ideal Index is the average price in the region per expenditure item i in wave 1 (denoted B_i). If the price of good i in cluster c is P_{ic} , then the Fisher Ideal Index in cluster c is calculated as:

$$L_c = \sqrt{\sum_i W_i^{1991} \frac{P_{ic}}{B_i} * \sum_i W_i^{2010} \frac{P_{ic}}{B_i}}$$

where W_i^{1991} is the budget share of good i in 1991 and W_i^{2010} is the budget share in 2010. These shares are calculated using the consumption data from KHDS-9194 and KHDS-2010 from the original clusters:

$$W_i = \frac{C_i}{\sum_{i=1}^N C_i}$$

The set of items for which the price was asked in 2010 was different than what was used in the previous rounds. In addition, also the consumption module was modified for 2010. These changes limit the number of items that can be used in the consumption basket to calculate the Fisher Ideal Index. Finally, 20 items were included in to the consumption basket. Table 2 provides a description of the consumption items and their budget shares in 1991 and 2010.

Table 2: Consumption Basket used to calculate the Fisher Ideal Index

Item	1991	2010	Growth
Battery	0.033	0.037	0.004
Beef	0.051	0.050	-0.001
Charcoal	0.029	0.038	0.009
Chicken	0.025	0.030	0.005
Chicken eggs	0.030	0.033	0.003
Cooking bananas	0.203	0.147	-0.056
Cooking oil	0.033	0.046	0.013
Dried beans	0.107	0.082	-0.025
Fresh milk	0.046	0.041	-0.005
Groundnuts	0.035	0.038	0.003
Kerosene	0.030	0.044	0.013
Linen	0.030	0.032	0.002
Local brew	0.043	0.040	-0.003
Onions	0.031	0.036	0.005
Raw cassava	0.062	0.059	-0.003
Rice (grade 3)	0.046	0.052	0.006
Sorghum	0.028	0.031	0.003
Sugar (grade 3)	0.056	0.063	0.007
Sweet potato	0.048	0.060	0.012
Tomatoes	0.034	0.042	0.008
Total (20 items)	1.000	1.000	

Missing prices for waves 1-4 were imputed using regression estimates (see KHDS-1 User's Manual for details). For KHDS-2004, the average price increase across the Kagera region was calculated. For KHDS-2010, the primary strategy for dealing with missing price observations was to replace them with the average price in nearby villages. The secondary strategy was to use the average price in the same district.

Any 2004 or 2010 price that deviates more than three standard deviations from the regional average for that good was set missing. Then the average across the non-missing price observations is taken per good per cluster.

Table 3 gives the Fisher Ideal Index for each cluster. On average, prices increased by a factor of 2.7 between 1991 and 2004 and by 7.4 between 1991 and 2010.

There are four urban clusters (No. 44-47). These clusters are only a maximum of two kilometres apart along the busiest tarmac road in the region. There is no reason to make different price indices for them. We take the average across the price observations between all these clusters and treat them as one cluster. This explains why the average Fisher index for the 51 clusters does not equal 1 for 1991. Table 4 provides the average Fisher index values for each passage, using 48 clusters for which a unique Fisher index value is applied.

Table 3: The 2004 and 2010 Fisher Ideal Indices per Cluster

cluster	2004	2010	cluster	2004	2010
1	3.76	9.00	27	2.91	7.58
2	3.90	7.92	28	3.76	7.58
3	2.85	7.91	29	3.50	7.60
4	3.79	8.80	30	3.70	7.10
5	3.62	8.53	31	3.75	8.46
6	4.16	9.57	32	3.84	8.39
7	4.18	8.69	33	4.40	6.88
8	2.92	8.04	34	4.75	7.59
9	2.99	8.65	35	4.10	7.60
10	3.03	7.99	36	3.13	7.38
11	4.07	9.85	37	4.03	9.53
12	3.08	7.99	38	4.18	9.93
13	3.24	7.37	39	4.10	8.70
14	3.40	8.12	40	4.30	9.38
15	3.90	9.33	41	4.03	9.85
16	3.22	7.20	42	4.55	9.18
17	2.88	8.10	43	4.08	9.47
18	3.23	8.18	44	4.58	9.57
19	3.80	8.73	45	4.58	9.57
20	2.73	8.64	46	4.58	9.57
21	3.31	7.64	47	4.58	9.57
22	3.28	8.02	48	3.89	10.0
23	3.41	7.27	49	3.80	6.88
24	3.13	7.01	50	4.49	7.83
25	3.36	7.15	51	3.00	8.04
26	2.70	7.21	Mean	3.70	8.36

Table 4: Average Fisher Ideal Index values for each wave ¹

wave	Fisher Index
1	1.00
2	1.09
3	1.23
4	1.39
5	3.64
6	8.28

¹ Waves 1-4 refer to KHDS-9194, wave 5 to KHDS-2004 and wave 6 to KHDS-2010.

iii. Households living in elsewhere in Kagera

For households living in Kagera, but not in the original cluster or nearby village, the nearest KHDS cluster was identified using the GPS coordinates.

iv. Households living in another region in Tanzania

For households living in Tanzania but not in Kagera, the inflation over time was imputed to equal the Kagera average. The spatial deflation was obtained by calculating a spatial Fisher Ideal Index from the 2010 data. The spatial dimension covers four spatial domains; 'Kagera', 'Dar es Salaam' and 'Other urban' and 'Other rural'. The formula for the spatial Fisher Ideal Index can be expressed as:

$$L_d = \sqrt{\left(\sum_i W_i^l \frac{P_i^l}{P_i^n}\right) * \left(\sum_i W_i^n \frac{P_i^l}{P_i^n}\right)}$$

where W_i^l is the budget share of good i in spatial domain l , P_i^l is the price for item i in the spatial domain l , W_i^n and P_i^n are the national budget share and price of item i , respectively.

The consumption basket used to calculate the spatial Fisher index is based on 20 items and the calculated budget share are provided in Table 5. Table 6 provides the index values for each domain.

Table 5: Consumption Basket used to calculate the spatial Fisher Index

type	Budget share in				
	Kagera	Dar es Salaam	Other Urban	Other Rural	National
Raw cassava	0.055	0.042	0.039	0.043	0.044
Sorghum	0.032	0.038	0.037	0.033	0.036
Rice (grade 3)	0.056	0.073	0.077	0.094	0.075
Sugar (grade 3)	0.062	0.058	0.062	0.063	0.060
Sweet potato	0.055	0.041	0.040	0.044	0.043
Dried beans	0.078	0.053	0.052	0.057	0.057
Groundnuts	0.039	0.040	0.039	0.037	0.039
Tomatoes	0.044	0.051	0.052	0.052	0.050
Cooking bananas	0.138	0.057	0.063	0.057	0.071
Cooking oil	0.047	0.050	0.056	0.059	0.053
Local brew	0.039	0.038	0.036	0.050	0.040
Onions	0.036	0.042	0.041	0.038	0.040
Chicken eggs	0.034	0.042	0.039	0.036	0.039
Chicken	0.032	0.045	0.042	0.035	0.040
Beef	0.054	0.085	0.078	0.079	0.077
Fresh milk	0.043	0.048	0.048	0.042	0.046
Kerosene	0.044	0.046	0.047	0.045	0.046
Battery	0.037	0.038	0.038	0.039	0.038
Linen	0.033	0.041	0.038	0.034	0.038
Charcoal	0.042	0.070	0.076	0.061	0.066
Total	1.000	1.000	1.000	1.000	1.000

Table 6: Spatial Fisher Index

Domain	Spatial Fisher Index	Spatial Fisher Index, Kagera as base
Kagera	0.846	1
Dar es Salaam	1.166	1.379
Other urban	1.017	1.203
Other rural	0.955	1.129

v. Households living in Uganda

For households living in Uganda, the Kagera inflation rate was applied for temporal price correction. The exchange rate was used for spatial correction. In 2004, the values were reported in Ugandan Shillings and are corrected in the price index using the exchange rate in 2004. In 2010, the interviewers converted the values into Tanzanian shillings during the interview and therefore, no *ex-post* spatial adjustments are needed.

vi. Comparisons with secondary data

According to the calculated Fisher Ideal Index, the inflation rate in Kagera since 1991/94 is 270 % by 2004 and 736 % by 2010. These estimated inflation figures for Kagera are next compared with the national consumer price index (CPI) over the same period in Tanzania as reported in the World Bank World Development Indicators. Table 7 provides the annual inflation rate in Tanzania since 1992.

Since most of the 2004 price data were collected in the first half of 2004, the 2003 annual inflation rate is likely to provide a better reference point. Depending on the choice of the base year, the national inflation rate over the period is between 343 % and 253 %. The estimated 2004 Kagera inflation rate is therefore in line with national inflation rate over the same period.

The 2010 price data were collected throughout the year, starting in April, and therefore, the 2010 year is used here for comparing the inflation rates. Contrary to 2004, the estimated Kagera inflation rate in 2010 is above the reported national inflation rate (512-664%) over the same period.

Table 7: Annual Inflation rate in Tanzania ²

year	inflation, consumer prices, average (annual percentage)	base=1992	base=1993
1992	22	100	
1993	25	125	100
1994	33	166	133
1995	28	213	170
1996	21	257	206
1997	16	299	239
1998	13	338	270
1999	8	365	292
2000	6	386	309
2001	5	406	325
2002	5	426	341
2003	4	443	354
2004	5	464	371
2005	5	487	390
2006	7	523	418
2007	7	559	448
2008	10	617	494
2009	12	692	553
2010	10.5	764	612

The National Panel Survey (NPS) 2008/09 and Household Budget Survey (HBS) 2007 provide an opportunity to compare the spatial Fisher Index calculated using the 2010 data. For comparison purposes, spatial Fisher index is re-calculated using three spatial domains, 'Dar es Salaam', 'Other urban' and 'Rural'. As shown in Table 8 below, the estimated spatial Fisher Indices are comparable to the estimates from other sources.

Table 8: Comparison of the spatial Fisher Indices from other sources

Domain	KHDS 2010	NPS 2008/09	HBS 2007	HBS 2000/01³	HBS 1991/92
Dar es Salaam	1.170	1.229	1.282	1.269	1.455
Other urban	1.021	1.141	1.064	1.059	1.146
Rural	0.960	0.925	0.937	0.965	0.940

² To make full use of the available data and to avoid noise to the extent possible, the base for the KHDS inflation figure is the average across the four KHDS-1 waves between 1991 and 1994. The bulk of these price data are from 1992 and 1993. Therefore we would expect the KHDS rate to lie in between the 1992 and 1993 CPI figures in Table 6.

³ The Fisher index values for HBS 2000/01 are suggestive; instead of a domain specific index, a regional level Fisher index was used.