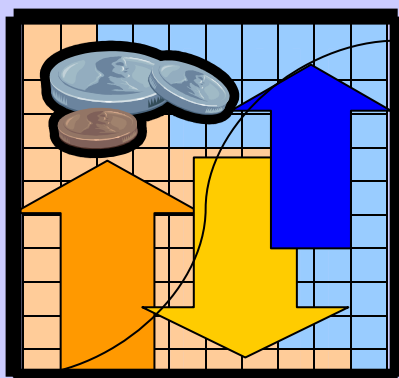




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**Assessing the Reliability
of
Household Expenditure Data:
Results of the World Health Survey**

DISCUSSION PAPER

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Assessing the Reliability
of
Household Expenditure Data:
Results of the World Health Survey

by

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World Health
Organization
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Abstract

The World Health Survey (WHS) which has been implemented in more than 70 countries with standardized questionnaires opens a great opportunity for research on health care financing issues. This study examines the household expenditures and health expenditure collected in the WHS in terms of reliability, consistency between different ways of data collection within the survey and with other types of household surveys.

Data used in this study include 50 WHS and 37 other type of surveys, namely the Living Standard Measurement Survey, Household budget Survey and Income and Expenditure Survey. The analysis consists of comparison of test-retest results; the aggregated and reported total household expenditure and health expenditure; the expenditures from the WHS and other type of surveys.

The results from test-retest are fairly similar in the WHS. For health expenditure the average of reported total is lower than the aggregated total while for household total expenditure the estimate is fairly similar from the two measures. Finally the WHS was found to report lower total household expenditure but higher out-of-pocket expenditure comparing with other types of surveys. The study suggests further efforts to standardize the questions in collecting expenditure data in household surveys for the purpose of cross country and over time comparison.

Introduction

Household expenditure data has been used extensively for monitoring general household living standards, wellbeing and consumption patterns.(1) More recently, considerable attention has been paid to monitoring household expenditures on health with a view to determining if the need to pay for services prevents some people from seeking or continuing care, and results in severe financial hardship or impoverishment for others (2-4). This literature has grown considerably over the last five years, with analysts using expenditure data from whatever source they can find, including the Living Standard Measurement Survey (LSMS) supported by the World Bank, Household Budget Surveys (HBS), Income and Expenditure Surveys (IES) and Socio-economic Surveys (SES)(5-8).

There has long been concern with the accuracy of expenditure data reported in household surveys, often linked to concerns about the abilities of households to remember a multitude of different types of expenditures accurately(9-11). Measurement error can be introduced at any stage of a survey: design of the survey instrument, data collection, or data entry(12). This is partly because household expenditure surveys are among the most difficult and expensive surveys to field and are sometimes undertaken with less than sufficient funding (13).

While these concerns are well established, there has been little attempt to understand the extent to which phrasing questions in different ways can influence the response to health expenditure questions, and whether different types of surveys produce consistent results. We contribute to this literature by comparing two ways of seeking information on health expenditure developed in the World Health Survey (WHS), and then also consider the extent to which the estimated expenditures are consistent with expenditure derived from other surveys undertaken in the same countries at approximately the same time.

The WHS were launched by the World Health Organization to strengthen national capacity to monitor critical health inputs, outputs and outcomes (14). They collected information on total household expenditure with a breakdown that included health expenditures, together with a wide range of indicators on health status, health service utilization, risk factors, and the perceived responsiveness of the health system. This makes the WHS appealing to policy makers and researchers seeking information on diverse topics including the assessment of inequality of health and in intervention coverage across different socio-economic groups. World Health Surveys have been implemented in 72 countries using standard questionnaires and many of the country data sets have recently been put into the public domain (<http://www.who.int/healthinfo/survey/en/index.html>).

Methodology

Instrument used in the WHS

The World Health Surveys currently available for analysis were conducted in 72 countries during 2002 and 2003. All are nationally representative using a multistage stratified random cluster sampling strategy. Data were collected at both the household and individual level. Among the 72 countries, 50 used the so-called long version household questionnaire (applied only in low and middle income countries) which gives details of the breakdown of total household expenditure and out-of-pocket health expenditure into their different categories.

The expenditure data were collected at the household level from the selected household informant. The questionnaire first seeks information on total household expenditure over the last month, and then asks details of item-by-item expenditure over the same period. The specified items are food, housing, education, health care, voluntary health insurance premiums, and all other goods and services. Respondents are asked to report on both cash and in kind payments. Health expenditure excludes transportation cost to obtain care and is net of insurance reimbursement. At another point in the survey, to check consistency, respondents are asked to provide item-by-item details of their health expenditures. In this case, the listed items are inpatient care, outpatient care, traditional medicine, dentists, medication or drugs, health care products, laboratory tests, and all other health care products or services.

The initial plan was that test-retests would be undertaken for a minimum of 10% of the sample in all countries conducting the World Health Survey. However, not many countries met the request. We therefore examine test-retest reliability for all surveys that reached the 10% sample target, and who retested more than 100 households. Twenty-four out of the fifty countries met these criteria. Retests were conducted within a week of the initial interview.

Other data sources used in the analysis

Thirty seven of the countries that have implemented the WHS had also conducted other types of household surveys with questions on total and health expenditure sometime during the period after 1990. The survey instruments differed and details are found in appendix 1, but they included Living Standards Measurement Surveys (LSMS), Household Income and Expenditure Surveys (IES), Household Budget Surveys (HBS) and Socio-economic Surveys (SES).

The LSMS and the SES are multi-purpose surveys where the expenditure module is an important component. The detail sought in the expenditure breakdowns and the recall periods varied by country, but in most cases, more breakdown items on household general expenditure were employed than in the WHS. For health expenditure, the number of questions in the comparator surveys ranged from one to as many as those in the WHS. Recall period also varied in these surveys. Typically a one-month recall period was used for frequent spending and a one-year recall period for durables, sometimes including hospitalization. The IES and HBS asked for a more detailed breakdown of health expenditures than the LSMS and SES.

Analysis framework

Reliability refers to the repeatability or consistency of a set of measurements or measuring instrument (15). A measure is considered reliable if it would give us the same result over and over assuming that what we are measuring isn't changing. Reliability could be characterized as either internal or external. Internal reliability is a measure of internal consistency. It compares two sets of data on the same subject using different measures. External reliability means the extent to which data measured at one time is consistent with data from the same variable measured at another time. The test-retest technique is commonly used to examine external reliability(16;17).

For internal reliability we compared the difference between the total reported in response to the single question and the total derived by aggregating responses to the questions asking for components of expenditure - called the "reported" and "aggregated" totals respectively. The test-retest information is used to examine external reliability. The intra-class coefficient index

(ICC) was used to explore both types of reliability and it was applied to the responses to total household expenditure and household health expenditures (18).

The ICC is calculated as

$$ICC = \frac{\sigma^2(b)}{\sigma^2(b) + \sigma^2(w)}$$

where $\sigma^2(w)$ is the pooled variance of a variable between survey administrations, and $\sigma^2(b)$ is the variance of the same variable between subjects (respondents). The ICC is interpreted as the proportion of total variance accounted for by between-subject or between-question variation. When there is no variance between the two administrations the value is 1.

Furthermore, the study compared the expenditure estimates produced by the WHS and the other types of household surveys undertaken in the same countries. The comparisons include food expenditure, total household expenditure and health expenditure, as well as the shares of food and health expenditure in total household expenditure. GDP deflators are used to convert the value from the survey years to the year 2000. Household sampling weights, where available, are used to account for differential probabilities of selection, and to ensure comparability across surveys.

Results

Results from test-retest in the WHS

Figure 1 reports the ICCs for the test-retest responses for total household expenditure and expenditures on education, food and health. Each vertical bar depicts a country, and the range shows the 95% confidence intervals around the mean estimate of the ICC. For most countries, the average value of the ICC is above 0.6 for all items, which is generally considered to imply good external reliability (19;20). The lowest for household expenditure is 0.28, for food 0.19, for education 0.39 and for total out-of-pocket health expenditure 0.22. Some countries have very high test-retest ICCs for all items, suggesting high consistency, examples are Sri Lanka, Myanmar, China, Uruguay, Malaysia and Pakistan. On the other hand, the average ICCs were consistently lower than 0.5 in Nepal and the Dominican Republic.

Insert figure 1

2. Comparison of the reported total and aggregated total expenditure in the WHS

Details of the ICC index in reported and aggregated total are found in Figure 2 where, again, each vertical bar represents a different country and ranges depict the 95% confidence interval around the mean estimate. For total household expenditure, the ICC is above 0.5 for all 50 countries with four exceptions - Mauritania, Zimbabwe, Ghana and Ecuador. For health expenditure the ICC index is lower than 0.5 only in 6 countries: Mauritania, Zambia, Uruguay, Swaziland, Kenya and Czech Republic. The band for total expenditure is much narrower than for health expenditures. This is mainly explained by the fact that there were less zero values or non-reports to the questions on total expenditures than on health expenditures.

Inset figure 2

The lack of consistency between the reported and the aggregated total is partly the result of some people reporting zero values to the question on the reported total yet then reporting positive expenditures to some of the components at a later point, or the other way round. Figure 3 showed in nearly all countries that more households responded to questions on breakdown items than to the reported total question on household expenditure. However, for health expenditure the results are not consistent across countries.

Inset figure 3

While this is important in itself, we also considered what happened in the non-zero cases by comparing the ratio of the reported total to the aggregated total. The average household total expenditure is similar between the two measures, with the difference never exceeding 20% except in the case of Ecuador (figure 4-a). For health expenditure, the average reported total across all respondents is smaller than the average aggregated total in all countries except Ecuador and Uruguay, in most cases by a substantial margin (figure 4-b).

However, because expenditure data rarely conform to a normal distribution, averages are sensitive to extreme values. To check if extreme values are driving these results, we also compared the ratios at different percentiles of expenditure: 5th, 25th, 50th, 75th and 95th. Figures 4-c and d show the results for both total health expenditure and total household expenditures in the two panels. Each box presents 50% of the observations with the upper hinge the 75th percentile, the lower hinge set at the 25th percentile and the bar showing the median.

Even though there is some variation in the ranges across the different deciles, there is no clear evidence that outliers are driving the results. However, the reported total gave a higher estimate than aggregated value in the lowest 5th percentile in health expenditure and slightly higher estimate in household total expenditure. This can be explained by the fact that a small number in the reported total reflects the sum of total spending while a small number in the aggregated total may only come from one item. There is no way to know whether other items are missing or zero.

Insert figure 4

3. Differences between the WHS and other surveys

Health expenditure and food expenditures, in absolute terms and as a share of household total expenditure, derived from the WHS were compared with the same variables derived from other types of surveys where this was possible - i.e. in 37 countries. Figure 5 presents the results for the shares of food and health in total household expenditure. In Figures 5 a and b, the horizontal axis represents the WHS estimate, and the vertical axis represents the estimate from the comparator survey. The diagonal line shows that the points at which the estimates would be identical.

The estimated share of health in total expenditure is consistently higher in the WHS (figure 4-a), with the exception of three countries where they give similar results. A similar pattern is observed for the share of food in total expenditures, with the exceptions of Kazakhstan, Laos and Comoros where the WHS suggests slightly higher shares (figure 5-b). The average share

of health expenditure in the 37 countries is 6.9% (ranging from 1.5-12.6%) in the WHS compared to 3.4% (ranging from 0.4-9.8%) in the other surveys, while the average food share is 58% (ranging from 42-74%) in the WHS and 51% (ranging from 25-78%) in the other surveys.

Insert figure 5

A higher proportion of health spending in total expenditure could be due to two things - health spending could be higher, and/or other spending could be lower. We explore this in Figure 6. In absolute terms, the average total household expenditure and average food expenditure derived from the WHS are both smaller than those derived from the other surveys in most countries (Figure 6-a). In addition, average health spending is higher in the WHS than in the other surveys in most countries, with 11 exceptions. Accordingly, in general, though not always, estimates of health spending from the WHS are higher than those derived from other surveys and that estimates of non-health spending are lower.

Further comparison by percentiles finds that in all selected 6 percentiles the household expenditure derived from the WHS is lower than those derived from the other surveys in most countries (Figure 6-b). The comparison on the food expenditure shows similar pattern across all percentiles, except the 5th percentiles which shows more variability than for people who spend more (Figure 6-c). For health, over 20% of households typically reported zero expenditures, which accounts for the inability to compare the responses for the 5th and 25th percentiles (Figure 6-d). In the other cases, there is considerable variation in the ratio with some evidence that outliers might be important for the 75% percentile.

Insert figure 6

Discussion

The WHS will be a major source for health and health system related studies. In the area of health financing studies, including out-of-pocket health expenditure, financial catastrophe and impoverishment by health payment, the WHS has great potential to fill in the gaps where no appropriate household surveys exist or where the existing surveys are not up to date. Information on quality of the data is crucial for researchers in analysing the data and interpreting the results.

Are expenditure data in the WHS reliable?

The results from test-retest reliability shows that the ICC is high in most countries. Apart from the reliability of the data the ICC is also influenced by the length of the interval between the two administrations. A short interval between administrations of the instrument will tend to yield too high reliability due to learning. Obviously a too long interval will lead to a low ICC as the spending has changed. In the WHS the interval between the two administrations is one week, ensuring that the two administrations are approximately comparable. Unlike constant variables such as sex, we do not expect the ICC in expenditure to reach 1. The interval between the two administrations is one week. So it is possible that the numbers in the test and retest data are different.

Do long expenditure questionnaires give a higher estimate?

Shorter questionnaires has lower survey costs compared to longer ones, while the longer ones seem to give more accurate estimates. However, it is not always true that the longer the questionnaires the more accurate the numbers obtained. In general the longer the

questionnaires the higher the estimates (21-24). In the WHS, no significant differences are observed in household total expenditure between reported and aggregated total from the 6 breakdown items. For health expenditure the aggregated total is greater than the reported total which is coherent with the literature.

One important variable in health financing research is health expenditure as a share of total household consumption. The study suggests that when using the WHS it is more appropriate to use the aggregated household expenditure (6 items) and the reported total health expenditure in order to estimate the share of health in total household expenditure. Still, it is obvious that the breakdown items on health give more information when studying the components of health spending.

Does the WHS overestimate health expenditure and underestimate other household expenditures?

The differences between any two surveys are expected because of the different survey years, survey designs and the different recall period(25). However the WHS does give higher estimates for health expenditure even compared with the reported total health spending, and yields lower estimates on food expenditure and other expenditures.

There could be several reasons. The most important factor is the survey design. The WHS is an intensive health focused survey. In such a situation the respondent may include spending on health that took place earlier than the past month, which would cause an upward bias. By the same token other expenditures in such health focused surveys may be subject to a downward bias.

The recall period could also contribute to the difference between the WHS and other types of surveys in health expenditure and other expenditure. In the WHS the recall period is one month for all expenditure items, while in other surveys various recall periods were used. Longer recall period may increase recall bias, but meanwhile it can capture more infrequent spending. The overall effect is not clear.

The length of the expenditure section questionnaires is another factor which can contribute to the difference. The WHS has much shorter questionnaires for household expenditure items than other types of surveys in. This may also account in part for the fact that food and other expenditures are lower in the WHS. This however, does not apply to health expenditure.

Finally, the WHS was conducted during 2002 to 2003 while the other surveys were conducted in earlier years. It could be that in some countries household total spending was reduced while health spending increased. However, this did not happen in all countries and comparing the differences between the WHS and other types of survey, the real changes in the expenditure pattern is trivial.

Conclusion

The WHS has great applicability to a range of health care financing studies. Countries need timely information to evaluate their health policies, manage their health systems and monitor progress. The WHS may be best viewed as another source of survey data to supplement the information provided by routine national information systems.

In this study we found that the expenditure data in the WHS are reliable based on the test-retest estimates. The aggregated total gives higher non-zero response rate than reported total in household total expenditure, but this can not be generalized to health expenditure. Furthermore, the average estimates from the two ways of asking questions yield similar results in household total expenditure. However, for health expenditure the aggregated total exceeds the reported total.

The results suggest that the intensive health focused WHS tends to give a higher estimate in health expenditure but a lower estimate in other expenditures. While the WHS is a good source for cross-country comparison studies, we need to be cautious with comparative studies using other types of surveys on household total expenditure and health expenditure. Finally, the study also proposes that standardizing the questionnaires in collecting household expenditure data would be beneficial in order to better conduct comparative studies across countries and over time.

APPENDICES

APPENDIX 1 *Data used in the analysis (50 countries)*

<i>country</i>	<i>code</i>	<i>survey name</i>	<i>type</i>	<i>year</i>	<i>sample size</i>
United Arab Emirates	ARE	World Health Survey	WHS	2003	1169
Burkina Faso	BFA	World Health Survey	WHS	2003	4930
Bangladesh	BGD	Enquête Prioritaire sur les Conditions de Vie des Ménages	LSMS	1998	8476
		World Health Survey	WHS	2003	5932
Bosnia and Herzegovina	BIH	Household Expenditure Survey	HES	1996	7420
		World Health Survey	WHS	2003	841
Brazil	BRA	World Health Survey	WHS	2003	4961
		LSMS	LSMS	1996	4850
China	CHN	World Health Survey	WHS	2003	3991
Côte d'Ivoire	CIV	World Health Survey	WHS	2003	3160
Congo	COG	World Health Survey	WHS	2003	2889
Comoros	COM	World Health Survey	WHS	2003	1831
Czech Republic	CZE	World Health Survey	WHS	2003	807
		Household Budget Survey	HBS	1999	2675
Dominican Republic	DOM	World Health Survey	WHS	2003	4950
Equador	ECU	World Health Survey	WHS	2003	4521
Spain	ESP	World Health Survey	WHS	2003	5685
		Encuesta Continua de Presupuestos Familiares	Other	1996	3104
Estonia	EST	World Health Survey	WHS	2003	994
		Household Budget Survey	HBS	1995	2818
Ethiopia	ETH	World Health Survey	WHS	2003	4274
Georgia	GEO	World Health Survey	WHS	2003	2754
		National Household Revenue and Expenditure Survey	IES	1999	2846
Ghana	GHA	World Health Survey	WHS	2003	4139
		Ghana Living Standards Survey	LSMS	1999	5998
Croatia	HRV	World Health Survey	WHS	2003	988
India	IND	World Health Survey	WHS	2003	10548
Kazakhstan	KAZ	World Health Survey	WHS	2003	4497
		LSMS	LSMS	1996	1994
Kenya	KEN	World Health Survey	WHS	2003	4594
Lao People's Dem. Rep.	LAO	World Health Survey	WHS	2003	4971
		Lao Expenditure and Consumption Survey II (LECS II)	HES	1997/98	8881
Sri Lanka	LKA	World Health Survey	WHS	2003	6777
		Household Income and Expenditure Survey	IES	1995/96	19631
Latvia	LVA	World Health Survey	WHS	2003	881
		Household Expenditure Survey	HES	1997/98	7684
Morocco	MAR	World Health Survey	WHS	2003	4996
		Enquêtes sur les conditions de vie des ménages	LSMS	1991	2574
Mexico	MEX	World Health Survey	WHS	2003	38483
		Encuesta Nacional de Ingresos y Gastos	IES	1996	13661
Mali	MLI	World Health Survey	WHS	2003	4242
Myanmar	MMR	World Health Survey	WHS	2003	6045
Mauritania	MRT	World Health Survey	WHS	2003	3749
Mauritius	MUS	World Health Survey	WHS	2003	3962
		Household Expenditure Survey	HES	1996	6233
Malawi	MWI	World Health Survey	WHS	2003	5488
		Integrated Household Survey	LSMS	1997/8	9118
Malaysia	MYS	World Health Survey	WHS	2003	6083
		Household Expenditure Survey	HES	1993/94	14628
Namibia	NAM	World Health Survey	WHS	2003	4249
		Household Income and Expenditure Survey	IES	1994	4384
Nepal	NPL	World Health Survey	WHS	2003	8790
		LSMS	LSMS	1995/96	3373
Pakistan	PAK	World Health Survey	WHS	2003	6440
		Pakistan Integrated Household Survey	LSMS	1991	4771
Philippines	PHL	World Health Survey	WHS	2003	10072
		Family Income and Expenditures Survey	IES	1997	39520
Paraguay	PRY	World Health Survey	WHS	2003	5268
		Encuestas de Hogares	LSMS	1996	2588
Russian Federation	RUS	World Health Survey	WHS	2003	3631
Senegal	SEN	World Health Survey	WHS	2003	3349
		Enquête Sénégalaise auprès des ménages (ESAM)	Other	1994/95	3274
Slovakia	SVK	World Health Survey	WHS	2003	1756
		Family Expenditure Survey	HES	1993	2129
Slovenia	SVN	World Health Survey	WHS	2003	660
Swaziland	SWZ	World Health Survey	WHS	2003	2801
Chad	TCD	World Health Survey	WHS	2003	4785
Tunisia	TUN	World Health Survey	WHS	2003	5118
		L'enquête Nationale sur le Budget et la Consommation des Ménages	HBS	1995	5140
Ukraine	UKR	World Health Survey	WHS	2003	2613
		Income Expenditure Survey	IES	1996	2272

Uruguay	URY	World Health Survey	WHS	2003	2971
		Encuesta de Gastos e Ingresos de los Hogares	IES	1994/5	3748
Viet Nam	VNM	World Health Survey	WHS	2003	4171
		Vietnam Living Standard Survey	LSMS	1992/93	4799
South Africa	ZAF	World Health Survey	WHS	2003	2378
		South Africa Income Expenditure Survey	IES	1995	29594
Zambia	ZMB	World Health Survey	WHS	2003	4157
		Living Conditions Monitoring Survey	LSMS	1996	11073
Zimbabwe	ZWE	World Health Survey	WHS	2003	4144

Figure 1. The intra-class coefficient (ICC) for test-retest

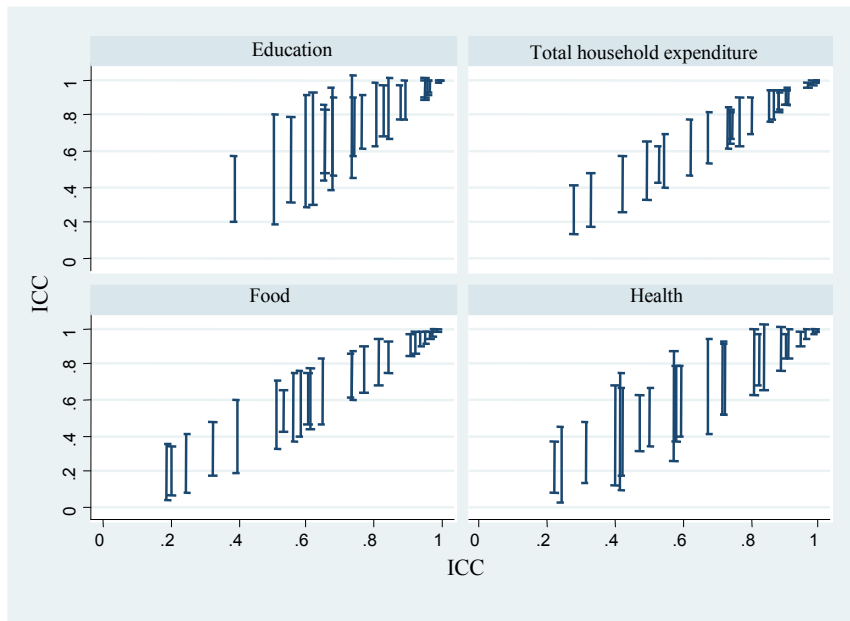


Figure 2. The intra-class coefficient (ICC) for reported total and breakdown total

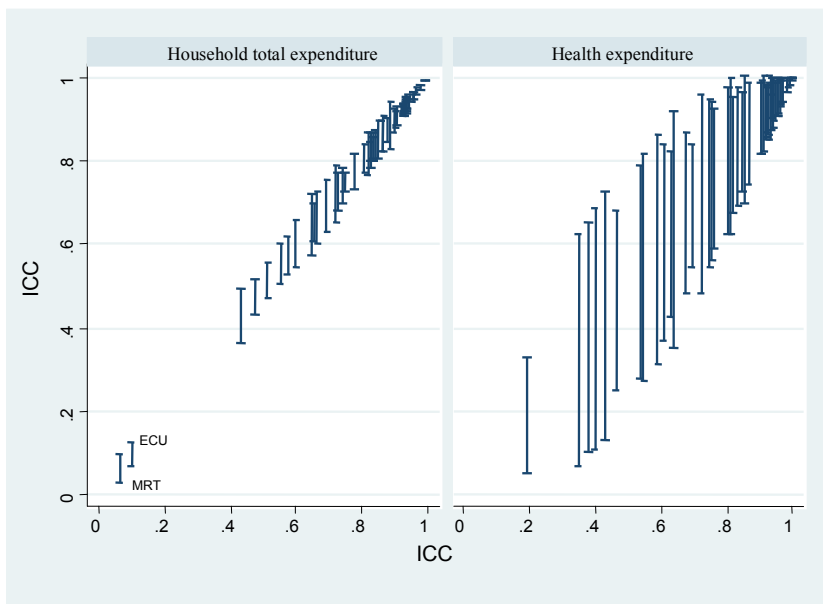


Figure 3. Fraction of reported zero values in household total expenditure and health expenditure

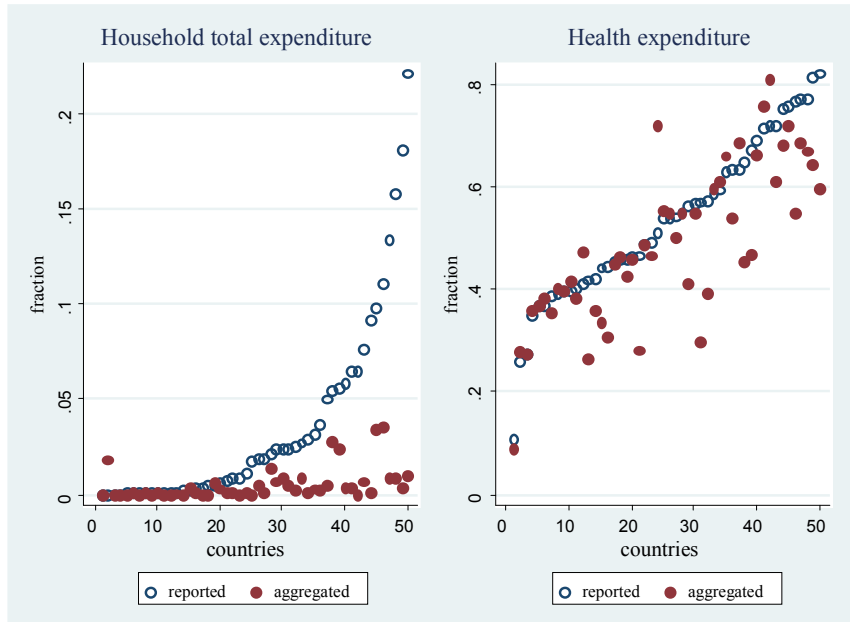


Figure 4. Comparison of reported total and breakdown total

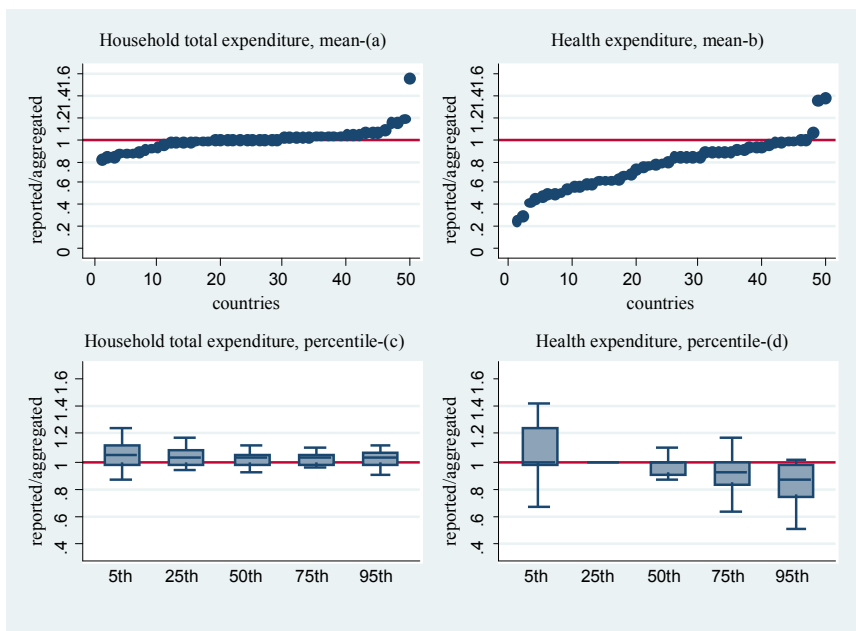


Figure 5. Food and health expenditure as a share of total household expenditure (WHS vs. other surveys)

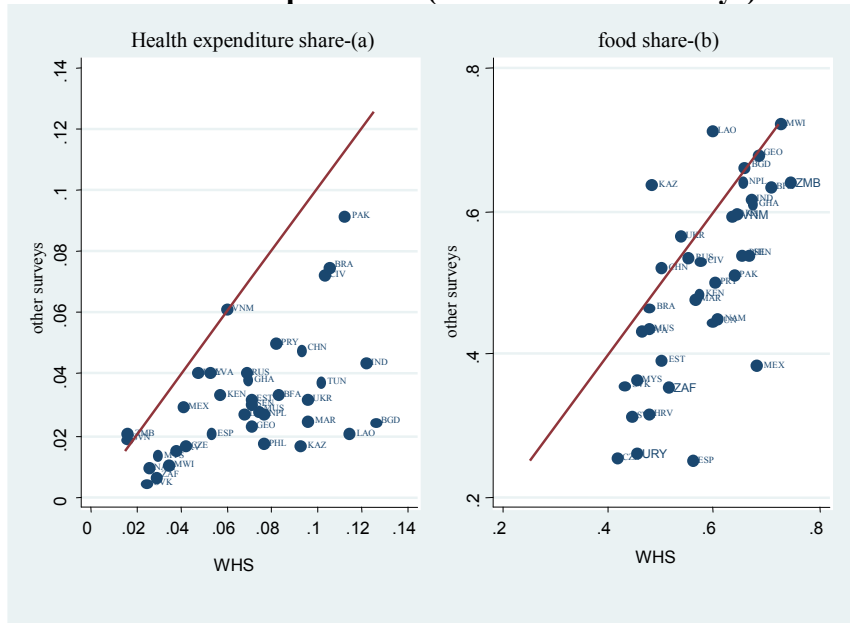
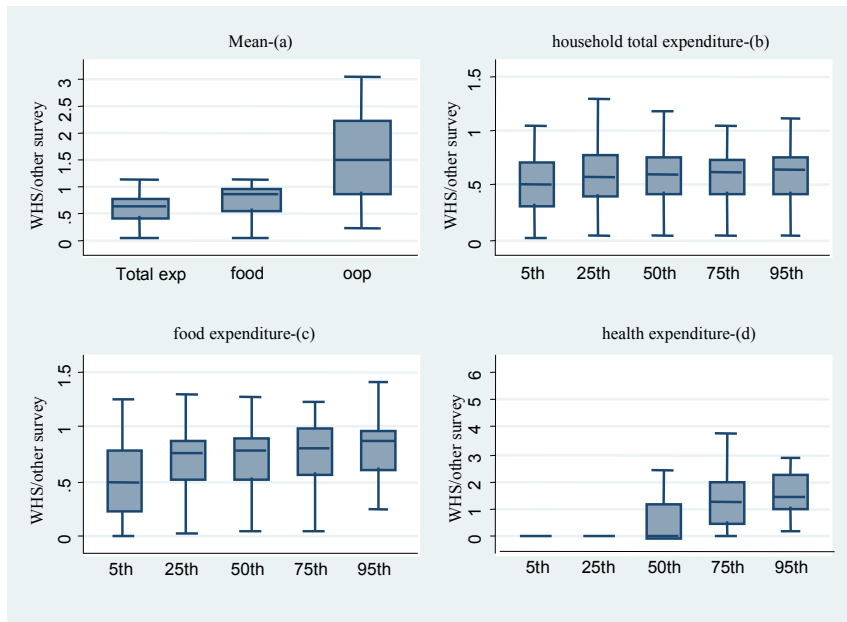


Figure 6. Total household expenditure, food and health expenditure in absolute terms (WHS over other surveys)



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