

SEWA PROJECT



AN IMPACT ANALYSIS OF PARTICIPATORY DESIGN AND USE OF TOOLS TO IMPROVE THE HEALTH AND PRODUCTIVITY OF WOMEN WORKERS IN THE INFORMAL ECONOMY

An outline of the scenario faced by working Indian women in 5 different occupations under the informal economy and a study of the reported effects of specific interventions, aimed at improving productivity and health, distributed to them.

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INTRODUCTION

94% of all self-employed workers in the country are engaged in the informal economy, half of which are women. They work long hours, earn very low incomes and are thus vulnerable to a variety of occupational health hazards which are important determinants of work, income security and social security. The awareness of occupational health risks and hazards amongst this working group is minimal unlike workers in the formal sector who typically have some form of employment training and statutory social protection. Typically women workers in the informal economy work in difficult conditions for long hours and suffer from a wide range of occupational health problems. Addressing occupational health and safety hazards are extremely important, as health is an important determinant of work, income security and social security; yet occupational health remains a neglected aspect in both public and private health care systems of this country, and perhaps most glaringly so in the informal sector.

The Self-Employed Women's Association (SEWA) is a national trade union of informal women workers in India. It has promoted the Lok Swasthya SEWA Trust to undertake welfare and provide social security services like health care, insurance and childcare to SEWA's members for the past several years. These programmes are aimed at poor self-employed women and their families. These programmes have also sought to address social security issues for informal sector workers at the policy level through advocacy efforts. The occupational health and safety of women workers is one such issue and The Lok Swasthya SEWA Trust (LSST), with support from the National Institute of Occupational Health (NIOH), the National Institute of Design (NID) and MAEERS' Institute of Design, Pune (MIT) have studied various trade groups engaged in the informal economy and, through need assessment surveys, have designed and developed tools (prototypes) to improve the lot of these workers. Additional support for this project was provided from Women in Informal Employment: Globalizing and Organizing (WIEGO) and the Department of Science and Technology (DST). Prototypes have been designed by NID, Ahmedabad and MAEERS' Institute of Design, Pune. These prototypes, aimed at reducing the occupational health risks and, thereby improving productivity, were then distributed to many groups; namely kite workers, ready-made garment workers, rag pickers, embroidery workers, and agricultural workers.

The Indian Institute of Public Health, Gandhinagar (IIPHG), is an Academic/Research institution established on the 7th of April 2008 as a private-public partnership with the Public Health Foundation of India (PHFI) and the Government of Gujarat (GOG). Aside from providing academic courses in the field of Public Health, IIPHG conducts and disseminates research to build knowledge and support development programs. We provide research based health policy advice to Government of Gujarat and other various government committees,

NGO boards and international advisory committees as well as hold teaching programs and conduct workshops at other IIPHs and other academic institutions. Our research areas include maternal child health, disease surveillance, nutrition, micro-finance, monitoring health programs and advocacy, heat stress, health effects due to climate change, etc.

As part of an M.O.U. signed on the 31st of December, 2012 with The Lok Swasthya SEWA Trust, this study and subsequent report were designed executed and delivered on the 30th of April, 2013.

OBJECTIVES

THE OBJECTIVES OF THE STUDY ARE:

- Ascertain the effect of the distributed interventions on the productivity and health of each group of workers through questionnaires and focussed group discussions.
- Gain perspective on the use and reaction of each prototype by their individual groups.
- Suggest possible actions for future prototype development and the improvement of worker health and productivity from the results, if discernible, from each group.

MATERIAL AND METHODS

Five different groups of workers were studied who were subjected to specific interventions in the form of with unique tool designed to suit their work environment.

Worker Group	Intervention used	Number distributed
Garment workers	Ergonomic chairs	140
Kite workers	Wooden tables	5
Embroidery workers	Improved embroidery frame	10
Sugarcane farmers	Improved machete or 'koita'	60
Rag pickers	Trolley or 'Lari'	5

TABLE 1- WORKER GROUPS AND THE TYPE OF, NUMBERS OF, AND FAMILIARITY WITH TOOLS USED

This study employs two different research methods to analyse the worker groups. A large number of garment workers chairs (coupled with the fact that distribution occurred 3 months before commencement of the study) allowed for the more robust Case-Control type study to be conducted. The other groups didn't see sufficient numbers distributed or used for an appreciable length of time to justify the same methods. Thus purely qualitative focussed group discussions (or FGD's) were conducted with the remaining worker categories.

Videos of the interviews and working postures were taken as appropriate and with the consent of the individuals involved.

Case-Control Study

Cases are defined by those workers that are living within Ahmedabad city limits who have continuously used and maintained the prototypes for a period not less than 4 months from the time of distribution. Controls were defined as those workers that have not bought or used the prototypes at any point in time. Cases and controls were matched for age, sex and socioeconomic status.

The initial design was to include 97 of the 140 workers, men and women, who had purchased a chair as cases and match them with 97 controls, thus adding up to a total of 194 people. Of the total 194, 5 were not using the chair for stitching and were therefore not included in the study. 4 of the users had moved outside the city limits of Ahmedabad and were therefore not considered for the study and 1 user had met with an accident and was unable to work/provide answers during sampling. Thus the total number was reduced to 184 people – 90 cases and 94 controls whose answers were noted and were part of the analysis for this study.

Socioeconomic status was graded by the Kuppaswamy Socioeconomic scale. The scale divides populations into 5 different strata based on 3 variables – Family Income, Educational qualification and Professional skill level. For the purpose of this analysis all garment worker were considered Semi-skilled. The work of a Semi-skilled individual is generally of defined, routine nature where the major requirement is not so much judgment and skill but the quick and through discharge of duties assigned to them. The work is thus limited to the performance of complex yet routine operations of limited scope.

A simplified quantitative Rapid Upper Limb Assessment (RULA) questionnaire, aimed at the ergonomic practices of each individual was administered to each individual as part of the quantitative analysis for this study. A questionnaire aimed at reporting productivity, occupational illnesses, and level of comfort with current equipment was also administered to each worker.

Focussed Group Discussions

Focussed group discussions were held with the remaining worker groups namely, Kite workers, Sugarcane cutters, Embroidery workers and Rag pickers. The respondents, both users and non users were asked consensually to provide information on their perceptions of

- the nature of their work
- the difficulties they encounter
- the occupational hazards they are exposed to
- their reaction to their respective interventions
- possible flaws and improvements in each intervention
- any measureable increase in their productivity

All results were documented in writing, audio recordings and photographs and subsequently summarized in this report.

Analysis

All data was collected and tabulated into a Microsoft Excel 2007 spreadsheet. The data was then subjected to the relevant statistical analyses. The differences in averages were calculated based on two-sample, two-tailed, heteroscedastic T-test (variances assumed unequal) except where paired T-test was indicated to have been used (also two-tailed). Pie-charts were used to indicate similarities and differences between the two groups. All anecdotal evidence was put into writing as the findings were

RESULTS FROM THE GARMENT WORKERS STUDY



FIGURE 1: GARMENT WORKER USING A WOODEN STOOL FOR WORK. WOODEN STOOLS AND PLASTIC CHAIRS WERE THE MOST PREDOMINANTLY USED DURING WORKING HOURS.

Garment workers or tailors are those men and women engaged in stitching to create or repair clothing using sewing machines. They are predominantly self employed but also outsource their work to larger companies or collaborate to form their own workshop. The garments they work with include but are not limited to shirts and pants for men, dresses, capris, blouses, churidar/salwar pajama sets, interlocking for handkerchiefs, duvet covers, etc

Almost three quarters of the population occupy the Upper Lower class of the Kuppuswamy Socioeconomic Scale, the rest occupying predominantly the Lower Middle class with only a few in the Upper Middle class. Family incomes vary between 1,000 INR and 20,000 INR and averaging about 5891 INR per month.

Both users and non-users seem to be fairly similar across the Kuppuswamy Socio-Economic scale and appear to be equally distributed across educational levels as well. There were fewer men the control group however as compared to the chair users but this should not significantly impact the results of this study.

The results obtained showed that chair users were clearly earning more than non-users by 1916.15 INR, which is roughly the cost of the SEWA chair itself. This result is highly significant however it cannot be determined if this result is caused by use of the chair or if people with higher income find it easier to purchase the chair. Considering that both users and non-users are relatively similar when compared to age, sex and socioeconomic status, it is more likely that this result is a product of using the chair rather than the other way around.

There is a definite decrease in occupational illness reporting; a result which is highly significant. Again, due to the nature of this study, it is difficult to ascertain if this result is the specific to chair use or if users may be biased toward reporting less (Confirmatory bias or Pride of Purchase). These issues may be ironed out by a more thorough study of the benefits of these tools.



FIGURE 2: CHAIR USER WHO MODIFIED THE SEWA CHAIR BY ATTACHING WHEELS ON THE STAND

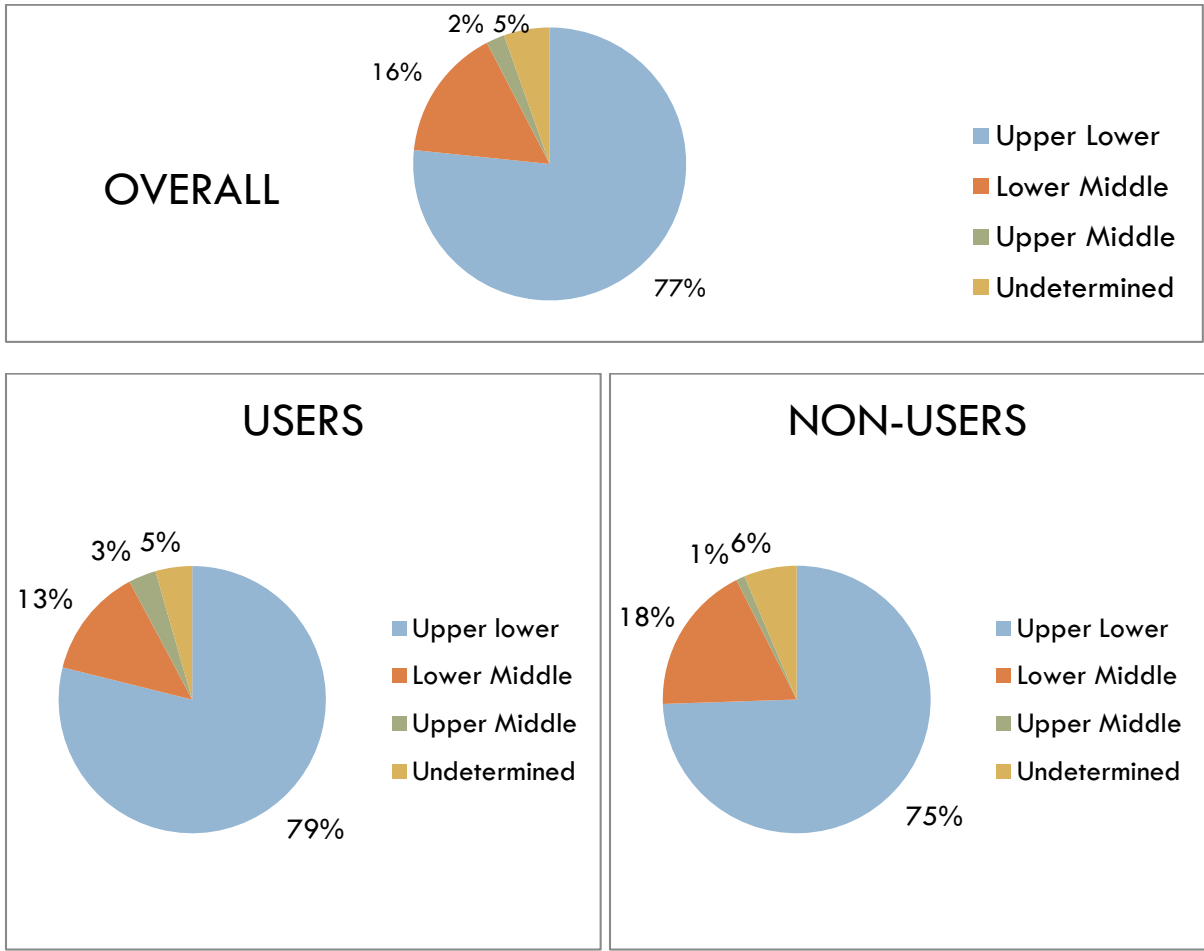


FIGURE 3: PIE CHARTS SHOWING THE SOCIOECONOMIC DISTRIBUTION OF THE SELECTED GARMENT WORKERS BY SOCIOECONOMIC STATUS

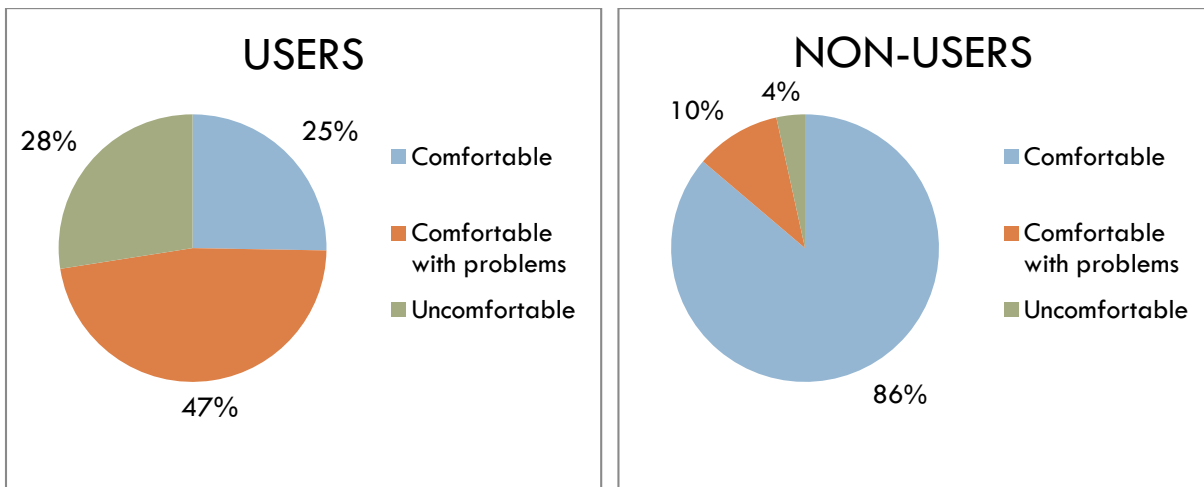


FIGURE 4: PIE CHARTS INDICATE THE DIFFERENCE IN THE LEVEL OF COMFORT PERCEIVED BY USERS AND NON-USERS

Items /day	Non-User	User	% increase in productivity	P (paired)
Blouses	1.7500	2.5714	46.94%	0.35654
Blouse & Dress	1.6667	1.8333	10.00%	
Churidar Pajama	14.7500	26.6667	80.79%	
Dress	6.6364	3.4167	-48.52%	
Shirt	7.6667	9.1429	19.25%	
Hanky Interlock	897.2727	1768.7500	97.13%	

TABLE 2: AVERAGE PRODUCTIVITY FOR DIFFERENT ARTICLES OF CLOTHING IN PIECES PER DAY AS REPORTED BY WORKERS

The garment workers were largely pleased with their chairs and reviews are generally positive; the negative feedback received was centred around a few users disliking the swivel and narrow backrest for the chairs, the fact that the chair accumulates heat during the day (due to its black leather cover which retains heat) and is difficult to rest on and the price of the chair is too high for the level of additional comfort it provides. Suggestions for improvements included

providing better support for the back and hands, making the seats larger and more accommodating. Adaptability and variety are the key features of an ergonomically well designed product. Since different people want different things, build a product that can be adapted to the users' lifestyle. For example one user, as seen in Figure 3, affixed wheels from an old suitcase to effectively modify the chair to complement her work style. It may be wise to encourage such indigenous adaptation by providing add-on options for a base chair thereby allowing the user to customise the chair to their own use. Ideas for such add on options may include wheels (as in the above example), option to add wheels for people that want them, swivel lock for those who dislike the feature, white heat repellent cloth covers and interchangeable, wider back rests for those who find the current backrest inadequate.

A major complaint amongst users and non-users alike was is not being able to afford the SEWA chair or other devices to improve productivity. This remains a critical issue in the distribution of these items if users are expected to continue on a free market basis. It may become necessary to either subsidise, either partly or completely, the cost of chairs in order to see a greater result.

Average changes in productivity as reported by users and non users (recorded as numbers of pieces per day) per different article of clothing showed that, apart from an apparent decrease in productivity for dresses, all other clothing types reported an increase in productivity as seen in Table 2. The relatively large value for p, which implies these differences are likely random, might be due to the variation of activities when dealing with different clothing items. Handkerchief interlocking, the procedure where the largest productivity was seen, is a relatively simple and quick procedure with industrious workers capable of handling 1000 items per day. However dress making and shirt stitching are more complex and time consuming and hence difficult to see a large difference in the rate of production. Given also that it is rare for a single worker to focus on only one task per day (i.e. doing several different procedures), it may be difficult to ascertain if there is an appreciable gain in productivity or given that they rarely focus their time systematically on a single job each day.

Analysis of RULA scores showed that the procedure may not be adequate in gauging the overall ergonomic benefits provided by the SEWA chair. Overall RULA scores of 3 indicate satisfactory performance but could be improved upon; indicating the need for further training in ergonomic best practices. Nearly equal RULA scores for both groups may suggest that, despite experiencing fewer illnesses, users and non-users have about

equal knowledge of ergonomic best practices; further advocating the need for training in equipment use and postural assessment will remedy further problems

A detailed list of the results obtained from the study is given on Table 3.

CATEGORY	VARIABLE	NON-USERS	USERS	P
Basic Information	Number	94	90	
	Men	18 (19.15%)	25 (27.78%)	NA
	Women	76 (80.85%)	65 (72.22%)	
Socioeconomic factors	Mean Age	32.84	34.92	0.142934
	Mean Family Income	4944.32 INR	6860.47 INR	0.000384**
	Mean Family Members	6.11	5.83	0.495646
Educational Level ⁺	Illiterate	23 (24.47%)	15 (16.67%)	0.75371
	Primary School Certificate	25 (26.60%)	25 (27.78%)	
	Middle School Certificate	17 (18.09%)	24 (26.67%)	
	High School Certificate	20 (21.28%)	19 (21.11%)	
	Post-High School Diploma	6 (6.38%)	3 (3.33%)	
	Graduate Degree	3 (3.19%)	4 (4.44%)	
Productivity factors	Mean Daily wage	83.04 INR	115.61 INR	0.00029**
	Mean Number of pieces produced	123.36	354.06	0.041863*
	Money spent on medication (reports)	33	17	NA
Working Habits	Mean Hours per day	5.32	5.95	0.057562
	Mean Days per month	17.89	18.93	0.110721
	Mean Months per year	7.74	7.98	0.452939
Musculoskeletal Disease Reports (Other Health Complaints) ⁺	Foot Swelling	18	3	0.0079281**
	Foot Pain	43	10	
	Hand Pain	15	3	
	Lower Back Pain	54	15	
	Neck/Shoulder pain	10	5	
	Knee Pain	23	3	
	Other Health Complaints	24	16	
	RULA	2.9892	3.0000	

TABLE 3: RESULTS FROM THE CASE CONTROL STUDY WITH GARMENT WORKERS [°PAIRED T-TEST *SIGNIFICANT **HIGHLY SIGNIFICANT]

RESULTS FROM THE FOCUSED GROUP DISCUSSIONS

Kite makers

The Scenario



FIGURE 5: WOMAN USING THE FLOOR TO MAKE KITES.

Kite makers have extremely seasonal work, usually for 3 months during kite flying season or 'Uttarayan' in Gujarat. They typically use wooden tables or the floor for work but in some cases other instruments that served to elevate the working area were also used. Most work on the floor without tables, which a previous analysis showed provided the worst conditions for the development of musculoskeletal diseases. The government provides some workers with free wooden tables which they utilize for their work which improves their working conditions marginally but complaints of health issues still plague workers. Pain in the hands, feet, lower back, eyes, neck and shoulders are common. Cuts and scrapes from sticks and allergic reactions the gum are also seen. These

women earn very little for their work, earning on average 70 INR/1000 kites, and as a result, were not able to buy the table without financial support. The tables being used have also been given out free of cost to encourage their use.

The Impact

Though a preliminary analysis, it was shown that ergonomic conditions for the workers had improved, reactions are mixed. Most consider the table good but have problems with its size and height, which is suitable for some people but not for others. The table tends to become unstable after use and wobbles too much. Also, given that the workers come into contact with water/liquids frequently, they dislike the mica top (which some had forcibly removed) to allow for better drainage. A general increase in productivity was seen (typically about an extra 500 kites/person/day, which 2 people reported) as well as fewer health problems from those working on the floor or by other means although cuts and



FIGURE 6: WOMAN USING THE SEWA TABLE. NOTICE THE DIFFERENCE IN POSTURE OF BOTH WOMEN ENGAGED IN KITE MAKING.

scrapes from handling sticks are still a common problem. The ability to stretch their legs out from under the table was also a well received by some women but the table was too short to allow for a fair number of women to do so.

Embroidery workers



FIGURE 7: EMBROIDERY WORKERS

The Scenario

Embroidery in Gujarat is largely done in 2 different styles – Abhla Bharat and Kutchi Bharat. Both these techniques require space and specialized equipment and raw materials. The old machine on which Kutchi Bharat is practiced costs 500 to 550 INR which is both a significant investment and, according to the artists' claims, inefficient in its operation.

2 pieces can be completed in 2 to 3 hours and they typically work 20-25 days month. Most work they have to find on their own, while a few people work for a dealer. Those that don't have a dealer bear all costs for transportation of goods. And earnings for both parties are typically 100 INR per day.

Back, shoulder and wrist pain are common along with eye pain from the strain of working on such delicate tasks for extended periods of time

The Impact

Embroidery workers find the new prototypes less tedious to work with since it's only a single piece and easier to set up for each piece. Back pain has reduced considerably and more time is saved per piece and their income has doubled from work (Now 200 INR). It is almost universally accepted that the 2nd wood prototype is better than the first which was cumbersome, difficult to keep steady, and move. Improvements suggested include an increase in ring size from 12" to 16" diameter to be able to work on larger pieces as well as the possible inclusion of a square frame to have greater area to work on.

Sugarcane farmers

The Scenario

These workers generally engage in Agricultural Labour and Animal Husbandry and harvest Sugarcane only during the harvesting season (mid-November to mid March). They are usually hired by the owners of the land to harvest the crop and are paid approximately 60-70 INR per day. They use traditional cutters or 'koitas' that are made with cheap iron with wooden handles wrapped in rubber or cloth. These koitas warp easily and lose their edge quickly; their hard handles cause bruises and splinter under constant use and make it extremely painful to use for prolonged periods of time. Workers experience hand, arm and shoulder pain and fatigue as a result of the poor cutting efficiency of these machetes. LSST had distributed 2 prototypes – one a few months back and the latest ones were distributed and used 15 days prior to interview



FIGURE 8: SUGARCANE FARMER

The Impact

The SEWA cutters are made from stainless steel and are thin and lightweight with plastic handles which labourers find easier to use, lighter and more resilient to wear and tear. An additional barb was fashioned at the tip of the blade which workers found useful for removing thorns and leaves during harvesting and wood collecting. Only a few women found the plastic handle uncomfortable and short and suggested that the handle be made with rubber so as to be more accommodating. A few of the plastic handles had also broken and we're not easy to fix which maybe also remedied by having an easy grip rubber handle. Though the women were not very aware of the apparent benefits to productivity, responses indicated that work

was done faster and an increase in productivity was recognized by some workers, who reported a doubling of harvesting speed (from 0.5 ton/day to 1 ton/day – from 9 days to 4 days).

At 100 INR, the price of the koitas are reasonable to most of the workers but, given some workers were living well below the poverty line, it may still be a significant investment to consider.



FIGURE 9: THE IMPROVED KOITA. NOTICE THE BARB AT THE TIP OF THE BLADE

Rag pickers

The Scenario

Rag pickers occupy the lowest strata of social and economic divisions and, as expected, their troubles are many and varied. These women are quite old and do not share the work with younger members of the family. After coming back home they segregate the waste. The younger members may help only at this stage. Some workers live close to municipal garbage dumps and collect refuse from them while others collect opportunistically. A rotation of work is fixed and areas assigned to particular women – some work near refuse and some go door to door. They usually collect 3 bags worth of refuse each day. Women typically collect refuse over the course of a week and sell them, but those who don't have the space to collect refuse, collect, sort and sell daily.

They can carry a maximum of 2 bags at a time and should they collect more, transportation becomes necessary; usually by cycle rickshaw which costs 25 INR /day. Some workers get their husbands to help collect refuse for them. Garbage bags are either given to them free by their buyers, or are bought at Rs. 10 if they not employed by specific buyers .Earnings are typically Rs. 25/bag and income is too irregular for these women to speculate on monthly income. Income drops during the rainy season when it becomes more difficult to collect refuse. They use a large plastic tarpaulin to protect the garbage during the rainy season and refrain from collecting paper during that time.



FIGURE 10: RAG PICKERS BEING INTERVIEWED



FIGURE 11: RAG PICKER WITH LARI

Lower back, hand, foot neck and shoulder pain are common given they carry each bag by hand. During this process with women also encounter dogs that territorially guard refuse dumps; many reported bites and scratches.

The Impact

Rag pickers showed the greatest benefit of all the groups. An extra bag of refuse, which is 33% more than the normal amount, can be carried which amounts to an increase in wages of about 25INR given that they need not employ a cycle rickshaw for their trouble. Even though the 'lari' All workers were pleased with the 'lari' and could only recommend that it have an extra hook

placed on it to aid in fixing a tarpaulin, a slightly larger wheel to increase the mobility of the cart, and a larger handle so that more people could push the cart with them. Health problems were significantly reduced and one woman reported saving up to Rs. 400 on medical expenses and pain management.

RECOMMENDATIONS

While some improvements to productivity and quality of life may seem obvious, in order to study if any absolute discernible gains can be observed and realized, it may become necessary to conduct a more rigorous study within similar or a sub-population of each group; particularly the garment workers. In that vein, conducting an intervention/cohort study would be ideal, particularly when the effectiveness of a tool or gadget is to be measured; however, given the scenario, this option was not available to us.

It may be of value to also undergo a more thorough study of the environmental factors that each worker is exposed to. This might be of particular interest to the rag pickers as they are, possibly of all groups addressed in this study, most vulnerable with regards to environmental exposures like heat, particulates from refuse burning and vector borne disease.

Continuous field testing and redesigning of the products based on evidence and feedback from the workers should be continued in order to ensure that the best design is made available to those who need it most.

CONCLUSION

Common elements of all studies show that proper education on ergonomics and good working practices may improve the lot of workers much further than just providing them with the best tools. We recommend that more work on the practices of these women workers be conducted so that these best practices can be realized and spread to the larger worker community.

Another significant hurdle is the cost of production and the fixing of an appropriate selling price. Despite the apparent benefits of each intervention, it may be still impractical for the wider population of workers, and, arguably, those that would benefit from it the most. The poorest in society are very vulnerable to all manner of health and social ills and we may have tools in our hands to help them help themselves. Yet if they remain out of their reach, it might only serve to exacerbate the problem. It may be wise to consider some form of subsidy, if not a total waiver, on the final price in order for it to reach the wider population.

By making tools more open to indigenous adaptation and modification, we also give workers the ability to customize their tools to suit their preferred mode of operation. The ultimate goal of this endeavour would be to allow workers to design and create their own tools or, at least, be able to choose tools that are best suited to their needs while minimizing occupational health risks. This again would be impossible without workers understanding the best working practices available for their jobs, the equipment, their working conditions, the diseases and health risks they expose themselves to and what is known and not known about protecting themselves from these risks. This will go a long way in improving the working conditions for workers in the informal sector.

“Give a man a fish and he won’t go hungry for a day. Teach a man to fish and he won’t go hungry for the rest of his life” – Chinese proverb