

## Inequality of Leprosy Disability in Iran, Clinical or Socio-Economic Inequality: An Extended Concentration Index Decomposition Approach

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### ABSTRACT

**Background:** Despite significant reduction in global disease prevalence, leprosy still has a high rate of disability while its determinants are unfair and many of them are amendable. The objective of this study was to measure inequality of disability in leprosy in Iran.

**Methods:** This was a cross-sectional study (2006-2007) on all living people affected by leprosy registered in W. Azerbaijan province health center, Western North of Iran. The outcome of the study was the socio-economic inequality considering presence or absence of grade 2 disability (G2D) based on the WHO classifications. An extended concentration index decomposition approach was used for analysis.

**Results:** Among 452 cases, 65.3% were male and 67% were affected by the multi bacillary type. Overall G2D was 65.3%. The estimated Concentration Index was  $-0.0782$ , showing presence of pro-poor socio-economic inequality of G2D, while extended CI estimation ( $v = 5$ ) was  $-0.163$ . Achievement index with coefficient ( $v = 5$ ) revealed that G2D mean was 16% more than classic mean in the poorest group. The result of decomposition of the existing inequality revealed that, some of the determinants such as receiving mono-therapy, education, urbanization, and bacillus calmette guerin (BCG) vaccination had shared contribution (67.4%, 61.8%, 59.2%, and 57.5% respectively).

**Conclusions:** This study provided new perspective for the health system to leprosy control considering the significant gap between rich and poor (inequality) regarding G2D disability, and its effective elements in socio-economic strata. Some effective actions can be considered to reduce the scale of existing inequality.

**Keywords:** Disability, inequality, Iran, leprosy

### INTRODUCTION

Leprosy as a neglected disease has both resulted in, and caused poverty since ancient time. Disability and stigma induced by leprosy, which widens the gap between the rich and the poor, is a

clear evidence of inequality in health aspect. This inequality is of course a lot more tangible and its stigma is more severe in countries where the disease is less prevalent. Despite one hundred years of academic and scientific debates, complete discovery of the causes and ways of transmission have not been clarified yet.<sup>[1]</sup> *Mycobacterium lepra* is known as one of the nine skin pathogenic mycobacteria with neuro-degenerative complications,<sup>[2]</sup> which are seen in all continents and races worldwide. According to the WHO classification, this disease is divided into two main groups of multi bacillary (MB) and pauci bacillary (PB). Delay in diagnosis, treatment and care as well as disease pathogen and immunological reactions lead to destruction of peripheral nerves and disability.<sup>[1,3-6]</sup> Leprosy is known as one of the most important causes of permanent disability in the world, which is mainly due to skin damage, paralysis of face, and hand muscles (secondary to motor neuron nerve damage) and damages and scars in the legs (anesthetic), not only results in secondary lesions as wound, shortening, finger erosion and clubbing, keratitis and blindness (impairment), but also it affects individual skills (disability), causes stigma and prohibits social activities (losing educational and job opportunities, disturbed social relations, physical dependence and poverty) of the afflicted (handicap). This tragic process leads to loss of social status (dehabilitation). Consequently, the patient has to inevitably abandon his place of residence and anonymously start a miserable life with other afflicted ones deprived of shelter and food security (destitution).<sup>[7]</sup> This dramatic start is an end to an absolute right of a normal, which is withheld from these patients. Despite the relationship between leprosy and poverty in the individual, social and national level, there is no association between the level of GDP and human development indices with the new cases of leprosy in different countries,<sup>[8]</sup> and all types of poverty including starvation, homelessness, more severe disease and death, inaccessibility to treatment and education services, job deprivation and fear from future are seen in a patient came down with leprosy.

Despite introduction of free of charge multi-drug therapy treatment (MDT) in 1981, the global campaign to eliminate leprosy in 1991, WHO's announcement on elimination of the disease in 2001 and 94% reduction in prevalence of the disease, it

still has a high-rate of incidence and international efforts have had the least effect on reducing disability and stigmatization caused by leprosy. Having failed to control the disease, the WHO decided to change "leprosy elimination strategy" to "reducing burden of the disease" (2000-2011) and continued controlling activities<sup>[4,9,10]</sup> via operational plans and programs (2011-2015) and validated the strategy of reducing burden of the disease by defining the index of equality and social justice as well as necessitating worldwide reduction of grade 2 disability (G2D) by at least 35% until 2015.<sup>[11]</sup> Once the act (2008) of human right committee of the UN makes governments committed to reduce stigmatization of leprosy and preserve dignity of patients and their families, the 2011-2015 operational plan would be of paramount importance.<sup>[12]</sup> The main problem of recovered cases of the disease, in particular the newly affected ones is disability and stigma induced by the disease.<sup>[13]</sup> This disability is mainly due to delayed diagnosis, which originates from different individual, social and cultural factors as well as accessibility to quality health.<sup>[14-16]</sup> In other words, early diagnosis, treatment and appropriate family support help treat and improve a large number of patients without disability.<sup>[11,17]</sup> Several studies in China, Bangladesh and Ethiopia have revealed that grade of disability is associated with delayed diagnosis.<sup>[18,19]</sup> Unequal distribution of disability in these patients is indicative of inequality of this outcome among patients affected with leprosy. Although underlying determinants of health are multi factorial,<sup>[20]</sup> they are unfair and undesirable and except for biological variations, the remaining ones are avoidable and amendable. To bridge the gap between different social groups which have avoidable difference in health outcomes, a systemic approach should be taken to amend and reduce them. To reduce health inequality, it is necessary to make it quantitative and measurable.<sup>[21]</sup>

Numerous researches have been carried out on clinical, basic, health care, disability, rehabilitation and leprosy stigma worldwide. But very few research studies have been designed to investigate health inequality regarding gender, place of residence and disease stigma. In these studies novel inequality indices, which have been introduced and applied by the World Bank over the past 10 years, were not used very well. This study is intended to assess

inequality of disability in patients with leprosy in the province of west Azerbaijan located in the North West of Iran, by Extended Concentration Index method and Achievement index method which are introduced by Mr. Adam Wagstaff<sup>[22]</sup> to determine effective factors on incidence of this inequality (decomposition approach).

## METHODS

This was an observational cross-sectional study (2006-2007) on patients with leprosy (undertreatment and terminated period of treatment) in the province of West Azerbaijan in the West North of Iran. Four hundred fifty-two leprosy cases were recruited in this study. These patients were examined according to a set of instructions by four trained general practitioners and their individual and health history, clinical examination (visual, sensory and motor neuron), evaluation of peripheral nerves and grade of damage and deformities as well as socio-economic determinants were checked and recorded. In this study, cases of leprosy, which were either under treatment or terminated treatment had been registered in health care system of provincial health centers, which were under full coverage due to disease diagnosis system and exclusiveness of medication for leprosy. The outcome was to consider presence or absence of G2D based on the WHO classifications. According to the WHO definition, any type of observable deformity in one of the upper or lower limbs and impaired vision, including loss of vision less than 6/10 or inability to count fingers in 6 m distance or lagophthalmos/iridocyclitis/corneal opacity are referred to as grade 2 disabilities.<sup>[23]</sup> Independent variables in this study consist of socio-economic status (SES), age, gender, education, method of diagnosis, grade of the disease, history of BCG vaccine, history of MDT, and place of residence. Having considered initial arrangements and permission, data of the study were collected in the cases' living place or work place (rarely). Principle component analysis was applied to develop the SES index. Of 23 considered variables the followings were used to develop SES index in principle component analysis (PCA):

Level of education, housing tenure (ownership, rental, ownership transfer) and condition, number of family in a household, number of bed rooms,

number of family members per room, fuel supply, light and electricity supply, sanitary toilet and bathroom, receiving donations from others and charity foundations. Then each case was classified according to the 5 groups to be utilized in the model.

## Analysis

Concentration index (CI) was applied to evaluate and measure socio-economic inequality in G2D of patients with leprosy.<sup>[24]</sup> This is a popular approach to evaluate health inequalities,<sup>[25,26]</sup> which due to demonstrating aspects of socio-economic inequality, evaluating inequality in all socio-economic groups and its sensitivity to manner of population distribution in social groups of community is unanimously accepted and approved.<sup>[27]</sup>

The estimated grade of disability by CI was not a real number, just an ordinal scale, based on which it is not possible to compare difference or relevance between two values of the index. Therefore, only dominancy could be estimated by this formula. For instance, CI interpretation in case of a dentist visit in Austria is 0.015, but in Portugal it is 0.259. The only thing to be said here is that inequality in Austria is less than that in Portugal, but it cannot be concluded that inequality in the latter is 20 times more than the former.<sup>[26]</sup>

With regard to changing approach from elimination and eradication to controlling or reducing health hazards, Extended CI was introduced and applied first by Adam Wag staff in 2002 in order to resolve interpretation limitations and provide the possibility of transparent and clear judgment based on CI index.

Inequality aversion and its numeric value depend on the manner of considered variable distribution. Giving an equal and balanced weight to individuals regardless of their SES is indicative of neutral attitude towards inequality, while giving more weight to individuals in lower SES is suggestive of aversion attitude towards inequality.<sup>[28]</sup>

The most important and practical features of Extended CI are as follows: Possibility of numerical comparison of health inequality in different conditions regarding time and place is provided. The obscure and vague judgment and interpretation is converted to a clear and transparent one, which is completely numerical

and helps modify authorities' attitude towards the issue of inequality. Scale of inequality aversion per different values for  $v$  (inequality aversion coefficient) can be estimated and possibility of accurate monitoring and observation is provided. According to inevitability of inequality in majority of health outcomes due to environmental reasons and individual features, possibility of reducing inequality with regard to supplies and resources is provided and it helps prioritize health programs to reduce inequalities in general.<sup>[29]</sup>

Decomposing the CI into its determinant factors (decomposing approach): Despite the use of CI and expanded CI indices in evaluation of socio-economic inequality and performance of socio-economic systems regarding distribution of health related variables along with designing managerial interventions and determining the gap between the rich and the poor and modification of health system in general, developing operational interventions and objectives necessitates taking measures to identify determinants of the existing inequality. Decomposition is based on identifying factors, which cause inequality among different socio-economic sectors in terms of the outcome variable (leprosy-induced disability). To identify important and influential factors on incidence of disability (outcome), the CI is decomposed and different effective factors which play a role in causing inequality are determined and share of each is estimated, then manner of distribution of the very factor or its effect on disability is evaluated, based on which by prioritizing effective factors, objective interventions would be designed and developed. Although, decomposition in the field of health was first applied for continuous outcome variable by use of regression (Ordinary least square [OLS]), due to the widespread use of Binary variables in health studies and inconsistency between OLS and Binary data, the Probit model was introduced and later with some simple modifications another model was introduced and practiced by Dr. Hossein Pour *et al.*, which is called "logit model".<sup>[30]</sup> In this study, linear regression model is applied, which links the considered health variable (Y) to a group of independent variables, which is also recommended by Wag staff.<sup>[31]</sup>

To determine proportion of each effective factor in disability inequality induced by leprosy, first correlation of each factor with the variable of

outcome should be calculated by use of regression models, and then they obtained regression equation is substituted in the main equation for CI. First, the CI is calculated for each independent variable and residuals and their equivalences are inserted in the regression equation, the result will be the overall regression equation.

Methodological stages of decomposition of socio-economic inequality of health outcome into its determinants:

- To regress the certain outcome versus determinants to determine independent variables coefficient by use of a proper regression model
- To estimate the mean of the outcome and determinants
- To calculate the CI of the outcome and determinants ( $C$ ,  $C_k$ )
- To calculate elasticity (multiplying the mean of each determinant by the relevant coefficient and dividing it by the mean of the total outcome)
- To determine proportion of each determinant entered the model by use of the formula
- To calculate percentage of proportion of each determinant by dividing the proportion of each determinant by the total CI.

It is noteworthy that the CI of the dependent variable, which is obtained in the linear regression model, will be different from the numerical value of the CI of the study due to the predictive nature of regression. In case it is used, the Error term is indicative of presence of other unknown factors.

Calculation of the achievement index: To evaluate effectiveness of health care systems, mean of health level had been applied until the year 2000. Since a health care system may have a successful performance in one aspect but a weak one in another, the overall attainment Index was vaguely used in the global health report in 2000, but in 2 year-time (2002) its calculation approach was introduced and has been applied since then. This overall attainment index consists of 5 overall health criteria and its distribution, overall level of responsiveness and its distribution, distribution of cooperation in supply of financial resources and combination of goodness (the best attainable mean level) and fairness (the least degree of difference among individuals and groups). This index calculates mean and inequality in a certain level ( $v$ ) of health in the form of a combined

assessment with giving a balanced weight to the mean of health outcome.

## RESULTS

As it is shown in Table 1, majority of patients were male (65.3%) and 67% were affected by the

**Table 1:** Leprosy affected patients' demographic and clinical characteristics (current situation), W. Azerbaijan province in Iran 2007

Characteristics	Frequency	Percent
Sample size	452	100
Gender		
Male	295	65.3
Female	157	34.7
Classification		
Multibassilary	303	67
Pausibasillary	149	33
Mean age at disease onset	37	-
Disability grade II		
Limbs	262	58
Eyes	164	36.3
Total	295	65.3
Occupation leave due to leprosy (in men)	135	45.7
Subsidy receive (government and NGOs)	210	46.5

NGOs=Non-governmental organizations

MB type. The G2D in limbs, eyes and overall G2D is 58%, 36.3% and 65.3% respectively. Almost half of the male patients (45.7%) had lost their jobs due to disability and about half of all patients (46.5%) are financially dependent on donations. Table 2 depicts the association between G2D and its risk factors by two modes of crude and adjusted analyses (Univariate analysis) and (Multivariate analysis) in logit model (CI: 95%). In this study a significant association was found between age at disease onset, education, BCG vaccine, the interval from clinical manifestation to diagnosis and G2D. The estimated CI in Table 3 shows that socio-economic inequality of G2D in leprosy affected patients was  $-0.0782$ , which is indicative of Pro-poor inequality. Extended CI was applied in order to gain a better insight into the real nature of inequality. Increased value of  $v$  from 2 (standard CI) to 5 results in extension of CI of G2D from  $-0.0782$  to  $-0.163$ , which is suggestive of the difference of the G2D between the most deprived and the poorest stratum more than two times in comparison with other socio-economic strata (the more negative the number, the more weight given to the most deprived and the poorest strata).

Achievement index is also included in Table 3. Coefficient one (of these indexes) is indicative of the mean of the numerical value of G2D which by

**Table 2:** Demographic and epidemiologic risk factors for disability grade II in leprosy affected in west Azerbaijan province in Iran 2007

Characteristics	Crude odds ratio (OR)			Adjusted odds ratio (OR)		
	OR	P	95% CI	OR	P	95% CI
Male sex	0.94	0.76	0.62-1.4	0.97	0.92	0.6-1.58
Attack age	1.02	0.000	1.01-1.04	1.03	0.002	1.01-1.05
Literate	2.72	0.000	1.62-4.55	1.34	0.4	0.69-2.6
Duration until detection*	0.706	0.04	0.51-0.98	0.61	0.01	0.42-0.9
Passive case detection	0.9	0.59	0.59-1.34	0.92	0.7	0.57-1.45
Monotherapy duration**	2.4	0.107	0.82-6.98	0.84	0.35	0.6-1.2
BCG vaccinated	4.7	0.000	2.77-7.9	2.00	0.04	1.02-3.91
Urbanization	1.2	0.39	0.78-1.84	1.00	1.00	0.58-1.71
Classification	1.18	0.43	0.78-1.8	1.45	0.12	0.9-2.3
MDT history	1.29	0.22	0.85-1.96	1.05	0.8	0.64-1.71
SES (the richest)	1	-	-	1	-	-
SES (reach)	0.64	0.07	0.39-1.04	0.93	0.85	0.48-1.83
SES (middle)	0.92	0.74	0.58-1.47	1.28	0.48	0.64-2.53
SES (poor)	1.66	0.04	1.02-2.71	1.83	0.09	0.91-3.67
SES (the poorest)	2.12	0.019	1.13-3.97	2.16	0.08	0.89-5.17

\*Between clinical manifestation to detection, \*\*Continuous monotherapy duration, OR=Odds ratio, MDT=Multi-drug therapy treatment, SES=Socio-economic status, CI=Concentration index, BCG=Bacillus calmette guerin

increase of the number of coefficient to 5, it leads to a 16% rise in the mean value. In other words, mean value of disability rises among them by giving more weight to the poor, which is an evident indication of pro-poor inequality and somewhat rise in dis achievement index.

The result of decomposition of the existing inequality in leprosy G2D was indicative of unequal and unfair determinant distribution of dependent variable. This analysis revealed that on the one hand, some determinants were unequally and unfairly distributed (CI for each explanatory variable), including urbanization, MDT history, MB leprosy affected, education, female gender, BCG vaccine, prolonged and consistent period of treatment with Dapsone drug, on the other hand, some of the determinants such as receiving monotherapy, education, urbanization, and BCG vaccination had stronger association with disability (the last two columns of Table 4). Very low proportion and effect of gender in disability CI was suggestive of relative independence of disability from gender in this investigation and this unequal distribution is an evident reason for defective health care system in leprosy affected

patient detection among women. Type of patient detection not only had a low  $CI_k$ , but also smaller proportion in the total CI disability. Also elasticity of each factor in relation with the proportion of that factor had an important effect on the total CI. In other words, the most significant and the largest proportion of inequality concerns with having education or not and receiving BCG vaccine or not.

## DISCUSSION

The objective of this study was to measure inequality of G2D in leprosy affected patients. This assessment first of all revealed presence of inequality in leprosy induced disability and second, objective measurement of the numerical value of inequality was made possible through this approach. Besides, result of this assessment as a proxy for quality of health care in leprosy showed that there is a problem with fair accessibility to leprosy health care services in the health network. Moreover, decomposing approach provided the possibility to relatively measure the source of inequality of leprosy induced disability and

**Table 3:** Summary statistics of extended concentration index and achievement index for different degree of inequality aversion in leprosy affected in west Azerbaijan province in Iran 2007

Disability grade II									
Extended concentration index (95% CI)					Achievement index				
C (0)	C (2)	C (4)	C (5)	C (5)-C (2)	AI (1)	AI (2)	AI (4)	AI (5)	AI (5)-AI (1)/AI (1) {relative change}
0	-0.0782	-0.144	-0.163	-0.085	0.652	0.703	0.747	0.759	16.41%

CI=Concentration index, AI=Achievement index

**Table 4:** Concentration index decomposition of leprosy disability grade II in W. Azerbaijan, Iran

Variable	Mean	Elasticity	$C_k^*$	Absolute contribution to $C^2$	Shared contribution (%)
Gender	0.34	0.003	-0.057	-0.0001	0.24
Education	0.84	0.549	-0.082	-0.0453	61.78
Age at onset	38.48	1.574	-0.005	-0.0075	10.2
Duration**	1.6	-1.3	-0.002	-0.0021	2.9
Passive case detection	0.33	0.058	0.005	-0.0002	0.39
BCG vaccine	0.83	0.965	-0.044	-0.0421	57.45
MDT history	0.33	0.087	-0.121	-0.0105	14.37
Urbanization	0.72	0.272	-0.16	-0.0439	59.23
Classification (PB, MB)	0.33	0.158	0.087	0.0139	-18.94
Monotherapy duration	42.91	1.04	-0.047	-0.0495	67.42
Continuous monotherapy	1.65	-0.084	0.038	-0.0033	4.53

\*Concentration index for each explanatory variable for disability grade II,\*\*Between clinical manifestation to detection, BCG=Bacillus calmette guerin, MDT=Multi-drug therapy treatment, MB=Multi bacillary, PB=Pauci bacillary

determine share of each numerically. Results of this study added new evidences to the previously existing data regarding the role of risk factors of leprosy induced disability.

Most of the current studies evaluated effective factors in incidence of disability, and they provide descriptive epidemiologic and sometimes analytical information regarding the disease, disability and some risk factors along with preventive measures. Besides, they highly advise early diagnosis, treatment and drug-induced complication treatment/treating adverse effects of drugs in all patients (all age groups and both genders) in order to prevent disability.<sup>[32-34]</sup> As a result, outcomes of such studies do not provide health authorities with clear and straightforward objectives and strategies to be developed and planned. They do not facilitate setting short, medium and long-term goals either. Therefore, the result of these studies (above) does not help authorities to prioritize strategies and measures based on the existing resources, in order to detect different social strata and susceptible patients and develop necessary interventions, nor estimate the rate of success in accomplishing each goal and objective they have already set. Moreover, drawing necessary comparisons between different countries or in one region during several years, based on defined indices, has not been made possible by these current investigations. The applied approach in this study could numerically clarify and assess all of these components. Results of this study on the one hand, guide health authorities from their previous superficial attitudes regarding health care management (e.g., mean values) towards deeper and more sophisticated levels and bridge the gap between the poor and the rich by means of objective management of resources and on the other hand, guarantee fulfilling equity indices in health issues, in particular lowering disparity in this regard.

This study showed that low SES is proportional to illiteracy, female gender, living in rural area, affected spouse and risk of the disease in higher age groups and it is directly related with G2D. Despite clear evidences regarding inequality in leprosy among socio-economic strata due to different reasons,<sup>[1]</sup> results of this study reveal that among evaluated leprosy affected patients (prevalence) mean of G2D is much higher (65%) in comparison with the WHO index (10%), the EMRO index (22%) and even the national mean (55%). Furthermore,

disability among patients of SES is unequally and unfairly distributed. Decomposition approach could estimate source of existing inequality in the form of demographic, socio-economic determinants, risk-factors and effective factors in health system. As it is expected, these factors do not play an equal role in inequality, since both prevalence of determinants in incidence of disability and degree of association (between determinants) are different.

Rather small sample size, recall bias due to the gap between the study and incidence, diagnosis and treatment of the disease and studying cases of prevalence. Since there was no non-response in this study, we did not face bias selection either and due to use of patients' recorded files, recall bias reached the lowest.

Effective factors in disability, which are identified in decomposition analysis, are the ones whose roles in majority of studies are evaluated and examined.<sup>[35,36]</sup> In this present study, proportion of gender, living place and type of the disease in disability were not very tangible, each of which will be explained in detail.

Although it seems that male cases of MB leprosy are two times more than women and cases of PB are equal in number between the two,<sup>[37]</sup> considering socio-economic, cultural and physiological reasons women have less access to and utilize social services (as health),<sup>[38]</sup> in different studies and evaluations the ratio of detected male patients to female (M/F) for instance in Yemen is more than three time and G2D is 40/6 (41%) and in Nigeria and Brazil this ratio is quite similar between males and females and G2D in males (23%) is one and a half times more than that in females.<sup>[39]</sup> In this study, ratio of patients and their disability is 1.9 (male to female), which could be due to women's relative access to health services and better coverage of health services in their case.

Higher prevalence in urban areas (in contrast with higher rate of incidence in rural areas) and accommodation in slum areas lead to polarization and consistent risk of disease transmission due to higher population density and increased exposure in family colonies or wanderers. Therefore, besides increased rate of poverty in urban areas, accessibility to health care services is influenced and present inequalities become more widespread.<sup>[16-40]</sup> Similarly, cases of leprosy in Iran

are seen more in rural areas, but at present more than 71% of cases of this study are located in margins of urban places (slums) and in the studied geographic area no significant difference is seen between urban and rural living places, which could be indicative of low-quality health care in both rural and urban regions (in contrast with what is expected). Passive case detection in conducted studies determines low-rate of disability. In this study, although more than 30% of diagnosis is estimated to be passive (with possibility of error), most of the patients were detected actively and also via periodical case detection and close contact, which itself explains high-rate of disability.

Inequality in social affairs is undesirable, which not only weakens social solidarity but also has an adverse effect on individuals' efficiency. However, consequences of inequality are more important and influential in the field of health in comparison with others.<sup>[41]</sup> Nowadays, inequality in health has become a global challenge within and between countries and health authorities and policy makers along with the international organizations including the WHO insist on reducing health inequalities, which is also officially accepted by governments. Moreover, governments are committed to explore causes and routes of health inequality and take effective measures and develop essential plans to reduce it accordingly.<sup>[42,43]</sup>

Leprosy induced disability is a sign of inequality in the field of health, which has a route both in public health care system and effective social determinants of health.<sup>[44-46]</sup>

This disease affects social life of patients, in particular in non-endemic countries where self-stigma, shame, and secrecy is higher,<sup>[47]</sup> which in fact leads to patients' deprivation of their social rights and ultimately isolates them from the society<sup>[48]</sup> and causes delayed diagnosis and treatment, which eventually results in increased incidence of disability and consistent disease transmission.<sup>[12]</sup>

The arisen misunderstanding among managers of health systems in majority of countries regarding the concept of elimination has resulted in suspension of controlling measures and supplies are shifted into other neglected tropical diseases, and even this misunderstanding has led to inequality in scientific research on leprosy. The assessment method applied in this study provides new opportunities

for the health system to control leprosy in order to take effective measures and develop consistent strategies to determine numerical mean of G2D and the possible gap between the rich and the poor, presence or absence of inequality and determine its numerical value (CI), estimate the present gap between the rich and the poor (Expanded CI), determine effective elements in incidence of G2D in socio-economic strata (Decomposition) which differs from country to country.

Hence, determining the scale or value of inequality aversion based on existing resources, monitoring and accurate observation will be made possible and the reduced scale of G2D inequality will be classified. Once similar studies and projects are implemented in different countries during several years, drawing comparison and evaluating success or failure would be realized.

## CONCLUSIONS

It is recommended that data of the study be collected simultaneously with diagnosis, onset of treatment and care (longitudinal studies) in order to carry out more accurate studies and evaluations. As a result of this, more novel knowledge will be generated regarding disease management which will also provide the possibility for international evaluations.

The present method is applicable in endemic and non-endemic countries. (In Iran, measures to control leprosy are integrated into health care system. This disease has initially and originally been in the stage of elimination and majority of patients are detected in the northern part, especially the East and the West North of the country. Given the Iranian epidemiologic characteristics of the disease, we can refer to smaller number of female patients, reduced female case detection over the past years and variable percentage of detected patients in relation with their living place. Cases of G2D have risen from 20% in 2000 to more than 55% during the past 10 years).

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