Trends in childhood immunisation amongst Muslim children of Punjab (India): An empirical study

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ABSTRACT

India's immunisation programme is one of the largest in the world and achieved great success over the years, however, some significant gaps are still observable in terms of achieving universal immunisation of children. Religion has emerged as a strong correlate for immunisation rates at national, state and global level. It has been observed that the rate of immunisation among children from Muslim families is comparatively less at global as well as at national level. Therefore, the paper attempts to understand immunisation trends among Muslims children from the north-western Indian state of Punjab. Based on the cross-sectional study of 400 households from district Sangrur of Punjab, results of the study show that rate of full immunisation among children from Muslim families was 88 per cent and none of the children were non-immunised. Reasons stated for partial immunisation of children included distrust of the government and belief that it would cause infertility amongst children. The present study reveals that religion per se does not appear to be influence rates of full immunisation. Geographical location, embeddedness of the community in the larger political and social milieu of their area, reach and acceptance of health workers at grassroots level emerge as strong factors contributing to higher rates of immunisation amongst Muslim children of Malerkotla.

Child immunisation represents a zone where the state coincides with the ideal of health for all its citizens. In the programmes of child immunisation world over interplay of power, knowledge, resistance and acceptance is observable. Conceptualising the notion of immunisation also implicates the concept of nation because "… the nation-state came to define the task of practicing the health of citizens as one of its basic functions…" [1]. Immunisation programmes are a way of protection against diseases as envisaged by the state and informed by the medicine. The problem arises when this power of the state is questioned at the level of community either as a critique for state's inadequate policy or as a mistrust of the state.

In Indian context, immunisation has emerged as one such site of struggle beginning from colonial past till its present existence. Since independence many measures have been adopted for immunisation of children against various diseases with the aim of prevention rather than cure alone. Expanded Programme on Immunisation (EPI) in the 1970s and the Universal Immunisation Programme (UIP) in 1985–86, promoted by WHO and UNICEF, are two such initiatives.

Even though India's immunisation programme is one of the largest in the world and achieved great success over the years, some significant gaps are still observable in terms of achieving universal immunisation of children. Various forms of struggles, resistance, opposition to immunisation have been documented on account of gender [2–4], age and education of

the mother [5–9], religion [8,10–12,14,15], region [11,14,16], etc. For example, as per National Family Health Survey (NFHS) 4, where Punjab ranks first amongst Indian states with 89% immunisation rate, Nagaland ranks last at 35% immunisation rate. Therefore, the universality and uniformity of immunisation programmes is not absolute and neither are assumptions about demand and supply for vaccinations sole criteria to look into and analyse the intricacies involved in immunisation trends. Academic and scholarly interest studying these intricacies of childhood immunisation got impetus particularly since year 2000 and more specifically since 2010 onwards where an increase is observed in publication of research papers and articles in journals. These studies attempted to understand the factors at both macro and micro levels that effected childhood immunisation rates in terms of socio-demographic variables and systemic factors. An understanding of the studies based on the Indian scenario reveals that these trends, however, reflect a complex relationship between religion, politics, socio-economic-cultural factors and child immunisation.

These differences have been attributed to two major factors: institutional including governance and social including political. The two factors are not independent amongst themselves but rather converge in a way that one effects the other directly. For the second factor religion, gender, education level particularly of the mother, socioeconomic status of the mother and the family, birth order and like variables have been identified as major

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influencers. Often, the aggregate picture of macro-statistics for all these variables masks the reality of complex and inter-related functioning between them. Amongst these, religion has emerged as a strong correlate for immunisation rates at national, state and global level. Based on aggregate numbers and rates of immunisation, it has been observed that the rate of immunisation amongst children from Muslim families is comparatively less at global as well as at national level [11–13,16–21].

Keeping in focus the significance of nuanced understanding of these complexities, the paper attempts to analyse immunisation trends amongst Muslims children from the north-western Indian state of Punjab. The aim is to understand if religion alone effects immunisation of children and what is the influence of other demographic and socio-political factors upon immunisation.

1. Material and methods

1.1. Rationale for selection of field site

Publicly available national level survey on health indicators, conducted every four to five years in India by International Institute of Population Sciences (IIPS) [24], called the National Family and Health Survey (NFHS) was utilised as the basis for selection of one state amongst 28 states of India. Comparing immunisation rates between NFHS conducted at different times shows a definite improvement and progress in immunisation of children in India. Since higher immunisation is directly associated with economic and social productivity through controlling deaths and morbidity amongst children, the target of the Indian state has been to maximise immunisation. However, within the country, diversity of immunisation rates is observed across states and within states as well.

Earlier studies in India focused on socio-demographic parameters affecting child immunisation, of which religion was one of the parameters. Other factors included family's socioeconomic status, education and occupation status of the mother, birth order, sex of the child. Only a few studies were based on religion specific data from districts or regions where low immunisation was already reported in the Muslim community through other large scale surveys.

This study rather considering religion as one of the socio-demographic parameters takes it as a primary base factor to analyse the trend of full immunisation of Muslim children with respect to other socio-demographic factors. Of the thirteen Indian states with Muslim population at 10% of the total state population, Punjab is the only state in north-western region of the country with high immunisation rate amongst children from Muslim families. Rate of child immunisation amongst Muslims of the state has been reported to be 67.2%. Rather than focusing on areas of low immunisation, it attempts to analyse the trend in Muslim majority region of Punjab (the state with highest immunisation rate in India as per NFHS) to observe if religion alone has the power to effect rates of childhood full immunisation or if some other factors emerge as prominent.

The state of Punjab is divided into 22 administrative units called districts. District Sangrur has the highest population of Muslims at 10.8% of the total population of the district (Census of India 2011) and the study is based on the Muslim population of this district. District Sangrur is further administratively divided into six tehsils, of which Malerkotla tehsil has the largest concentration of Muslims at 33% of the total population of the tehsil. For the study, Malerkotla city and its surrounding rural areas were the focus. Within Malerkotla tehsil, the Malerkotla city is the largest urban centre and has a sub-divisional hospital. Therefore, it was selected as the nodal point for the study.

1.2. Selection of households

Total sample of 400 households was selected in equal rural-urban proportion from Malerkotla city and its surrounding rural areas through purposive sampling fulfilling the inclusion criteria. Inclusion criteria for selection of households was those with at least one child between 2 and 5 years of age. The age criteria of 5 years for children has been made to ensure that

any time lapse for full immunisation may be covered. Sample size of 400 has been calculated based on the formula $N = z^2 \times (pq/d^2)$.

$$N = (1.96)^2 \times \left[67.2 * 32.8/(5)^2 \right]$$

$$= 352.67$$

$$\approx 400.$$

{N = minimum sample size.

z = Standard score corresponding to a given confidence level (z = 1.96).

p = Prevalence of immunisation in population(67.2 as per NFHS 4).

q = (1 − p) or percentage of failure (32.8).

d = Precision limit or proportion of sampling error usually 5% confidence limit}.

The formula was used to calculate the sample size since proportion/rate was one of the parameters of this descriptive study. Since rate of immunisation for Muslims in Punjab is 67.2% considering deviance at 5% the sample size comes out to be 352 and rounded off to 400 households. These households were identified with the help of Auxiliary Nurse and Mid-wife (ANM)/ Accredited Social Health Activist (ASHA).

Further data analysis is based on chi-square tests for 400 households. In case of households with more than one child falling in the inclusion criteria of 2 to 5 years, the eldest child has been considered to study the correlation between various variables and full immunisation. Therefore, even though the total number of children between 2 and 5 years of age is 479 and amongst them those with full immunisation is 423, the calculations have been made on basis of total number of households, that is, 400 because the unit of study was the household through the mother of the child.

1.3. Data collection and analysis

The main respondents of the study were mothers of children between 2 and 5 years of age from the selected 400 households. The data was collected through semi-structured questionnaires consisting of socio-demographic profile of the households with specific focus on the mothers, immunisation records of all the children fulfilling the inclusion criteria and perceptions of mothers about immunisation of children in relation to religion. Questionnaire was discussed in detail with the subject experts and government health officials dealing with immunisation. The construct is multidimensional in nature, therefore subscales were constructed to assess different components of a construct. Same weights were given to all subscales as all components were equally important for the analysis. The immunisation cards of all the children in a household were also physically verified and checked by the research team to avoid any discrepancy in data.

2. Results

The results of the study have been divided into sections based upon various demographic details like age of the mother, family income, gender of the child, birth order, education level of the mother, etc. Immunisation trends have been analysed according to each mandatory vaccination with respect to each of these variables.

2.1. Demographic details of the mothers

The overall demographic information of the households shows that they belonged to lower income groups who primarily depended upon government health facilities for health related concerns and the women who were the mothers of the children were economically dependent on their families. The per month household income (mainly earned through jobs like labourer, daily wage earner, worker in a shop or nearby industrial unit) varied between 5000 Indian rupees to maximum of 20,000 Indian rupees. 78.3% women were between 25 and 34 years of age. Around

66% got married between the age of 18 and 22 years and about 10% of them got married before the age of 17 years and 55% of women had been married for at least more than 3 years. Maximum women, 23.5%, were educated till matriculation, followed by 21.3% who had completed education till middle school, 18.8% till primary level and 16.5% had no formal education. Around 14% women have had their education till higher level. In all maximum women were educated till school level only. Maximum women were housewives at 92.0%. Those who were earning, were working as agricultural labourers, had a small shop, were daily wage earners or worked as house maids.

Amongst 400 women interviewed from selected households, 900 pregnancies were reported by them. Of these total pregnancies, 886 were successful with live births at 98.4%, however, later 22 child mortality were reported amongst successful deliveries. 14 still birth or miscarriages were reported. Maximum deliveries were institutional deliveries at 90.7%. The study also finds that proportion of women who had received tetanus vaccination during their pregnancy was 91.0%. Therefore, the utilisation of health facilities and health programmes by women from the selected households, during any of their pregnancies, was high.

The female to male ratio of children ever born comes out be prefect 1:1 with total number of males ever born amounting to 443 and total number of females ever born also amounting to same number. However, the comparison also shows that more number of females ever born in terms of birth number reach maximum upto 11 whereas the maximum number of ever born males born went upto 3. This clearly depicts prevalence of son preference in the sampled population.

2.2. Trends in child immunisation

Full immunisation rate of children between the age of 2 to 5 years in selected households is 88.3%. Table 1 shows proportion of children fully immunised as per birth order. The proportion of full immunisation decreases consistently till third birth order, increases for the fourth birth order and again decreases for the fifth birth order.

Table 1
Full immunisation rate per birth order.

C1	BCG	P1	P2	P3	DPT1	DPT2	DPT3	Measles	Fully vaccinated
Yes	200	191	189	188	192	190	188	190	188
Total	205	205	205	205	205	205	205	205	205

C1 91.7% fully immunised

C2	BCG	P1	P2	P3	DPT1	DPT2	DPT3	Measles	
Yes	180	165	164	165	170	166	165	165	164
Total	185	185	185	185	185	185	185	185	185

C2 88.65% fully immunised

C3	BCG	P1	P2	P3	DPT1	DPT2	DPT3	Measles	
Yes	63	54	55	55	55	55	55	55	53
Total	70	70	70	70	70	70	70	70	70

C3 75.71% fully immunised

C4	BCG	P1	P2	P3	DPT1	DPT2	DPT3	Measles	
Yes	16	16	16	16	16	16	16	16	16
Total	16	16	16	16	16	16	16	16	16

C4 100.0% fully immunised

C5	BCG	P1	P2	P3	DPT1	DPT2	DPT3	Measles	
Yes	2	2	2	2	2	2	2	2	2
Total	3	3	3	3	3	3	3	3	3

C5 66.67% fully immunised

	BCG	P1	P2	P3	DPT1	DPT2	DPT3	Measles	
Yes									423
Total									479

88.3% fully immunised

Table 2
Place of residence and full immunisation.

Variable Urban / Rural	Outcome: Place of residence and full immunisation (N = 400)
Chi square statistics	12.659 (0.000)*
Odds ratio for full immunisation	2.60
C·I.	1.519–4.457

Table 3
Full immunisation amongst children across age of the mother (N = 400).

Mothers age less than 30 years and otherwise	Fully immunised / Otherwise (N = 400)
Chi square statistics	11.757 (0.001)*
Odds ratio for full immunisation	2.406
C.I.	1.442–4.017

Table 4
Education of the mother and full immunisation.

Mothers education (two groups: for illiterate (including primary) and educated including middle and above) Chi square statistics (*p*-value)	Illiterate/primary and educated (N = 400)
Chi square statistics	10.313 (0.001)*
Odds ratio	0.438
C.I	0.262–0.730

Table 2 depicts significant chi-square value suggesting significant association between the two variables of place of residence and full immunisation. Odds ratio of 2.6 indicates that fully immunised children in urban areas are 2.6 more likely compared to rural areas. More than 1 confidence interval suggests that the odds ratio is statistically significant.

Significant chi-square value for the variables mothers age and immunisation suggests significant association between the two variables. In addition, the odds ratio value along with the confidence interval being more than 1 suggests that the children of mothers more than 30 years of age are more likely to be fully immunised as compared to children to mothers of lesser age (Table 3). Table 4 shows significant chi-square value for mothers' education and immunisation that suggests significant association between the two variables. However, the odds ratio value along with the confidence interval being less than 1 suggests that the children of illiterate mothers are less likely to be fully immunised as compared to children to mothers of higher level of education. There is 56% (1–0.438) decrease in the odds of children being fully immunised with illiterate mothers.

In terms of effect of caste on full immunisation of Muslim children, Table 5 chi-square statistics suggests that the two variables are independent.

The chi-square statistics for correlation between sex of the child and full immunisation suggests no significant association between the two variables (Table 6).

Table 5
Caste and full immunisation.

General caste and Backward class	Illiterate/primary and educated (N = 400)
Chi square statistics	0.027 (0.868)

Table 6
Sex of the child and full immunisation.

Female/Male	Gender and Immunisation (N = 400)
Chi square statistics	0.388 (0.534)

Table 7

Family type and full immunisation.

Family type	C1	C2	C3	C4	C5
Joint	77 (41.0)	56 (34.1)	12 (22.6)	1 (6.3)	
Nuclear	111 (59.0)	108 (65.9)	41 (77.4)	15 (93.7)	2 (100.0)
Total	188 (100.0)	164 (100.0)	53 (100.0)	16 (100.0)	2 (100.0)
Chi square statistics (*p*-value)	0.034 (0.853)	1.373 (0.241)	0.952 (0.329)	–	–
N	205	185	70	16	3

Family type	Joint and Nuclear (*N* = 400)
Chi square statistics	1.750 (0.186)

Table 8

Type of house and full immunisation.

Type	C1	C2	C3	C4	C5
Kutcha	10 (5.3)	10 (6.1)	7 (13.2)	3 (18.8)	
Semi-Pucca	74 (39.4)	72 (43.9)	24 (45.3)	9 (56.2)	1 (50.0)
Pucca	104 (55.3)	82 (50.0)	22 (41.5)	4 (25.0)	1 (50.0)
Total	188 (100.0)	164 (100.0)	53 (100.0)	16 (100.0)	2 (100.0)
Chi square statistics (p-value)	4.664 (0.031)*	0.822 (0.365)	2.779 (0.095)	–	–
N	205	185	70	16	3

As shown in Table 7, within each birth order the trend of higher proportion of fully immunised children is from nuclear families in comparison to joint families. Also in case of only nuclear families the proportion of fully immunised children increases with increasing birth order and the trend is opposite in case of joint families with proportion of fully immunised children decreasing with increasing birth order. However, insignificant chi square statistics suggest that there is not enough evidence to prove that the two variables are associated.

Chi-square statistics suggest significant association between type of house and immunisation only in case of first birth order (Table 8). Moreover, the overall analysis suggest that there is not enough evidence to suggest that the two variables are associated (Table 8a).

Overall, significant chi-square value suggest significant association between monthly income of a family and child immunisation. The odds ratio value suggest that children of families with income more than 10,000 Indian rupee are more likely (2.13) to be fully immunised compared to children of low income families (Table 9).

The perceptions regarding negative influence of immunisation on children amongst Muslims in the present study have been highlighted by very few mothers. Of the total 479 children in the age group of 2 to 5 years, 56 were partially immunised. These families were concentrated in specific clusters in rural areas of Malerkotla tehsil. Reasons for partial immunisation have been attributed to after effects of vaccination and distrust in the government. Some of the respondents mentioned having heard rumors (24%) that discouraged them from getting their children immunised. This included mothers of both fully and partially immunised children. Maximum ignored such rumors but a few (2.0%) accepted them as the truth. These

Table 8a

Type house and full immunisation.

Type of house and full immunisation	Full/semi kutcha and Pucca (*N* = 400)
Chi square statistics	0.993 (0.319)

Table 9

Monthly income of the household and full immunisation.

Monthly income and full immunisation	Below and above Rs 10,000/– (*N* = 400)
Chi square statistics	4.592 (0.032)*
Odds ratio	2.132
Confidence interval	1.055–4.311

aspects reflect the larger global narrative as a conspiracy to reduce population of Muslim which has been highlighted by other studies as well.

Maximum respondents, however, had their children fully immunised and were in favour of it. Role of community health workers like the ANMs and ASHAs is important aspect in acceptance of immunisation.

An ANM reported,

"People did use to cooperate earlier. They were afraid of getting their children vaccinated. When we used to go out for pulse polio coverage, people used to hide their children in the almirahs, cupboards, manger. But slowly we tried to counsel them, explained them the necessity and benefits of it and finally after sometime we were able to get them to immunise their children. Even now at times they do not cooperate, but things have changed a lot. It is easy to convince them of the reality now. But when MR was introduced, we started facing the same problem of distrust. People believed that this vaccination was government's plan to reduce Muslim population and would make children infertile. Then I took my own child to the school and vaccinated him myself in front of the entire village. Since then people have started coming forward for it".

Another ASHA mentioned,

"There is no specific reason. They all say that this is government's conspiracy. They say what we would know we are Hindu. People say the medicine is changed so that Muslim children become infertile. We used to explain to them that with same bottle a Muslim and a Hindu child are given polio drops or BCG vaccination".

Religion, again, per se does not appear to be influence rates of full immunisation in the present study. Geographical location, embeddedness of the community in the political and social milieu of their area, reach and acceptance of health workers at grassroots level emerge as a contributing to higher immunisation amongst Muslim children of Malerkotla.

3. Discussion

Results of the study also show that none of the children were non-immunised. Maximum children were fully immunised and a small proportion of children were partially immunised. Reasons stated for getting children partially immunised included distrust of the government and belief that it would cause infertility amongst children. It would be safe to conclude that rather than vaccine rejection, there was vaccine acceptance and vaccine hesitancy by a very small proportion of respondents.

Also the gender gap in child immunisation observed in the study is negligible. Another study also makes similar observation in their study on religion and childhood death in India that gender difference in under 5 mortality and immunisation amongst Muslim children is insignificant [22]. Comparable results were also reported in a study [11] on religious affiliation and immunisation. The present study also shows that proportion of child immunisation is higher in urban areas in comparison to rural areas. However, differing results of higher rates of full immunisation in rural areas in comparison to urban areas are reported in other studies [12,14,20].

The statistical analysis in present study finds that children of mothers more than 30 years of age are more likely to be fully immunised as compared to children to mothers of lesser age. Awasthi et al.[3] Differing results vis-à-vis mother's age and full immunisation of children where children of mothers less than 30 years of age were more likely to be fully immunised have been observed in other studies in Indian context [5,6].

Mothers' education and immunisation suggests significant association between the two variables. Children of illiterate mothers are less likely to be fully immunised as compared to children to mothers of higher level of education. In another study [9] authors observe linkages between maternal education and child immunisation where they observe that, "Immunisation rates rose sharply with mother's education through upper primary education. After the upper primary level, the returns from additional years in secondary school or university were positive…" (338). On the contrary another study [7] found that proportion of full immunisation coverage decreased with increase in mother's education status. The observations of these studies was not with respect to any one particular religion. Even though immunisation of children was supported by maximum households, yet independent decision making of the mothers was less. The age at marriage was also low, level of higher education was also less, and occupational and economic dependence of women on other family members was high. Many studies have revealed that higher education level of mothers was related to high level of full immunisation amongst children. However, in a patriarchal set up it must be given due consideration that education, let alone higher education, is not a matter of privilege for all women. The present study shows that it is not the education level alone that affects the demand for immunisation of children. Role of health workers and family and larger community is also significantly important.

Caste wise the results of the present study depicts no significant relation between caste and full immunisation of the children from Muslim families. In relation to caste some differences in immunisation based on caste particularly amongst Scheduled Caste and Scheduled Tribes and Backward Castes have been observed in a study [14]. These references, however, appear for children from Hindu religion who have second highest rate after those from general caste within the religion. No reference in particular to Muslim children vis-à-vis caste is confirmed. In terms of sex of the child the study does not show any correlation between gender and full immunisation. However, dissimilar results between gender and full immunisation have been reported in other studies [2,14,20] where gender gap in full immunisation of children is observed irrespective of religion. On the other hand, similar to the present study, another study on Muslim majority countries of Sub Saharan Africa [11] did not find any gendered differences on immunisation of Muslim children.

There is not significant evidence to prove any association between type of house or type of family and immunisation of the children in context of the present study. Whereas a study on child immunisation in different Indian states [7,8] revealed opposite results where higher proportion fully immunised children were from joint families. The results of these studies were irrespective of the religion of the families of the children.

Comparing the results of the study with those of NFHS 4, for the state of Punjab, for given socio-demographic variables reveals few differences. The present study shows higher proportion of fully immunised children from urban areas similar to NFHS 4 results. As per sex of the child, NFHS 4 shows higher proportion of full immunisation for female child but the study shows no significant relation between sex of the child and full immunisation. For the education status of the mother, NFHS 4 shows

consistent increase in proportion of full immunisation of children with increase in education level of the mother, the present study also shows an increase in similar manner. Differing results are observable for the age of the mother between the present study and NFHS 4. As per NFHS 4 the full immunisation proportion of children decreases with age of mother with highest immunisation proportion for mothers between 15 and 19 years of age. As per the study the proportion of fully immunised children increases with age of the mother.

4. Conclusion

Immunisation is one of the many mechanisms through which "the relationship between the state, as represented by public health care system, and the people, as in, … children (and hence the larger community) is shaped" (Coutinho, Bisht and Raje[8]). Achieving targets under immunisation programme becomes a measure of evaluating state's performance on public health indicators. It not only entails evaluating state's performance but also of health workers and health personnel. Coutinho, Bisht and Raje[8] summarise specific goals of immunisation as,

"Health for all = socially and economically productive citizens.socially and economically productive citizens = lower IMR/MMR.lower IMR/MMR = lower number of VPD related cases/deaths.lower number of VPD related cases/deaths = higher immunisation coverage" [23].

In Indian context, the studies at macro level were largely based upon DLHS and NFHS data, at micro level studies focused on certain specific districts in states. In these studies religion was the part of larger repertoire of factors affecting immunisation of children. The present study takes religion as the primary factor and other socio-demographic factors are considered as contingent upon it. Earlier studies focused on districts or regions where low immunisation was already reported in the Muslim community through large scale surveys. This study rather than focusing on areas of low immunisation attempts to analyse the trend in Muslim majority region of Punjab to observe if religion alone has the power to effect rates of childhood immunisation or if other factors emerge as prominent.

Findings of the study reveal that more than education status of women, gender of the child or income of the family, it was perhaps the constant work of community health workers who made them aware about vaccine preventable diseases. Even though immunisation of children was supported by maximum households, yet independent decision making of the mothers was less. Level of higher education of the mothers was less, their occupational and economic dependence on other family members was high. Many studies have revealed that higher education level of mothers was related to high level of full immunisation amongst children. However, in a patriarchal set up it must be given due consideration that education, let alone higher education, is not a matter of privilege for all women. The present study shows that it is not the education level alone that affects the demand for immunisation of children. Role of health workers and family and larger community is also significantly important.

Results of the study also show that none of the children were non-immunised. Maximum children were fully immunised and a small proportion of children were partially immunised. Reasons stated for getting children partially immunised included distrust of the government and belief that it would cause infertility amongst children. It would be safe to conclude that rather than vaccine rejection, there was vaccine hesitancy and vaccine acceptance. It reflects embeddedness, commitment, acceptance of health workers in the larger community. This facilitated access and acceptability of immunisation programme at community levels. At the same time social and political sense of security of the community also contributed to reduced hesitancy. Therefore, location like Malerkotla, where the two factors work in tandem with each other record high rates of immunisation amongst children from a particular community which otherwise in many places shows low rates immunisation.

Considering that immunisation of children from Muslim families of Malerkotla depicts positive trends, it may be considered as case study

wherein more than religion, location and social and political embeddedness of the community is more significant.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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