

Do patient satisfaction and health improvement affect sustainability of voluntary co-location clusters? Evidence from Vietnam

Quan-Hoang Vuong

Background: Over the past 15 years or so the phenomenon of voluntarily co-located patients communities has been emerging. Patients, especially the poor, have chosen to live together, seeking/lending supports from/to one another. Nonetheless, despite the existence of these communities, little is researched or known about how those co-located patients as main subjects of the clusters perceive the value they receive and see their future connection to the communities they are, or were, living in. Answering these questions helps us to better understand the prospect of those community, in terms of sustainability.

Methods: The study employs the method of categorical data analysis, specifically multiple logistic regressions, to investigate relationships between groups of factors such as perceived degrees of satisfaction with financial means provided by the communities, and reported health improvements (predictor variables), and patients' short- and longer-term commitments to these communities (response variable).

Results: All groups of factors, and variables entering the analytical models, have shown statistical significance upon successful estimations based on the provided empirical data sets. The results suggest two meaningful empirical relationships following the data modeling efforts: 1) between financial stress facing patients and the financial benefits they received from the community, and their propensity to stay connected to it; and 2) between general level of satisfaction, health improvements, and patients' long-term commitment to these communities. Overall all, financial benefits and health improvements are found to influence a significant increase in probabilities for patients to become committed to their communities in the short and long term, respectively.

Conclusions: This study is to inform policy makers and social workers in healthcare sector about the realities that patients choose to stick to the co-location clusters have an economic reason: finding means to fight their financial hardship. This may suggest a higher degree of complication in dealing with social matters for poor patients than many previously thought of. The issue of suitable income-generating jobs for patient may probably be ignored by the majority of the public by only focusing on charity programs and giving in-kind donations (which turn out to be not very useful). With respect to social policies, it is noteworthy that patients are not those who seek to ask for supports but can potentially be the donors as suggested by the evidence found that the probability of staying committed to the community increase upon completion of medical treatments, seeing health conditions improve.

Keywords: Voluntary communities, Co-location clusters, Financial benefits, Low-income countries, Vietnam

JEL Classifications: I12, I19

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Abstract:

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Background

The co-location of poor patients in small clusters within the urban areas, mostly near major healthcare centers has been emerging in larger cities in Vietnam, such as Hanoi. Despite their existence and functioning, the phenomenon of voluntarily co-located patients has rarely been reported in the extant literature of social and public health. As a transition society, currently carrying out and implement changes in its healthcare system, Vietnam is subject to uncertainties of healthcare outcomes, and the most vulnerable groups are the poor [1]. Unfortunately, co-located patients fall into the most desperate category of the patients among all. They need the community (cluster) for different meanings, but one of the most important is a type of "economic intervention" self-organized by patients sharing the hardship in life. We know that such need arising from harsh realities of attending medical treatments is not just limited to the poorer countries like Vietnam, but also exists in rich countries, such as Japan [2].

Healthcare researchers have reported evidence suggesting the value of financing scheme such as universal health coverage (UHC) or micro health insurance (MHI) in mitigating the health risk for the poor [3]. Nonetheless, underdeveloped health financing systems in most developing countries are still unable to cope with changing patients' poverty landscape in this fast-changing period.

There is evidence indicating that Vietnamese patients have been facing higher risk of destitution [4] and decreasing quality of life [5, 6]. The problem appears to have been more complex than one normally thinks about it, for various reasons, from undeveloped healthcare and health financing systems, to complication of treatments for chronic diseases [4, 7] or complicated policy-making processes [6].

Therefore, it is somewhat "natural" for an increasing number of Vietnamese patients to have chosen to seek life and financial protection by living together in voluntary co-location clusters [8] where they expect to lend and receive supports to and from one another; the act that could possibly help to reduce burdens, to share resources, as well as to satisfy their information needs [9].

The ultimate rationale for the existence of those communities is to improve patients' quality of life [7, 10], and thus enhance the chance of realizing healthcare values for their long-term treatment [11]. This expectation is rational and realistic even for patients in countries with better healthcare and well-functioning health financing systems such as Sweden [12] where co-financing and different forms of collaborations are still among efficient choices of providing healthcare resources to the public.

It is not difficult for us to see that for a country with average income of US\$2,300 (as of 2016) like Vietnam, patients with lower socio-economic status face more hurdles during their treatments as costs emerge to be major barrier to basic treatment facilities, quality medicine and adequate care giving [7, 13, 14]. Therefore, co-location clusters that help share basic amenities, reduce costs of accommodation for some become the only choice [15, 16, 17]. People would expect those communities may help satisfy part of patient needs with either in-kind benefits that the communities may be able to offer [8] or financial means, including income-generating activities [18]. Living together gives them the chance of drawing attentions from the public and becoming recipients of social workgroups dealing with public health matters, although real-world implementation always faces difficult-to-solve challenges [19].

What we do not know much about is for those patients who live in voluntary co-location clusters, how do they see the value of financial benefits receiving from the community and once their medical treatments are

over, will they continue to stay connected/committed to the community? This knowledge is important as answering the questions may help us learn more about the prospect of the communities, in terms of their sustainability.

This short article attempt to answer these questions employing survey data collected from the patients. Before moving on to a description of the data sets and methods, two major hypotheses are presented next, helping to make our research questions become specific and feasible to answer with the data in hand.

The main research hypotheses (RH), which are going to be tested for acquiring the insights reported in this article, are stated below.

Research Hypotheses (RH):

RH1. Patients' short-term (i.e., only during their treatments) commitment and bonding to the community is influenced by their degree of financial shortage and satisfactory financial benefits provided by the community.

RH2. Patients' longer-term (i.e., post-treatment bonding) commitment to the co-location community is affected by their perceived overall satisfaction and actual health improvement.

Materials and Methods

Data Set

The raw data employed in this research have been collected by the research team at Hanoi-based Vuong & Associates from December 2015 through March 2016, containing 336 observations from four different clusters of co-located patients in Hanoi, Vietnam. Following our hypotheses as proposed in the preceding discussion, they are structured into two contingency tables, representing two data sets.

Data for RH1:

The first data set that is used to assess the degree of significance of patients' financial needs, reflecting on their expectation from the community, and the degree of satisfaction is given in Table 1. The examination views the gap between expectations and actual deliveries as an important assessment that influences patients' long-term commitment to their co-location community. Thus the first hypothesis following data for RH1 investigates patients' perception about the participation in these clusters as indispensable or not, during their medical treatment period, against two groups of predictors: their financial needs (“Need.fin”) and actual income/money provision (“Ben.fin”) from the community, directly or indirectly.

In light of the above, “Need.fin” has two values: “nonurg.fin” and “urg.fin”, representing lower and higher degree of desperateness for financials by a patient. Likewise, “Ben.fin” has two values “met.fin” and “unmet.fin” showing whether a patient assesses the financial benefits from the community to be satisfactory or not.

Table 1 (Data for RH1). Distribution of patients following their perceived short-term commitment against financial expectations and satisfaction while being co-located

“Need.fin”	“Ben.fin”	“indisp.dur”	“disp.dur”
“nonurg.fin”	“met.fin”	68	1
	“unmet.fin”	120	71

“urg.fin”	“met.fin”	14	4
	“unmet.fin”	32	26

As mentioned above, patients' commitment (“Commitment”) to their community serves to be response variables in this investigation: “indisp.dur” (indispensable) and “disp.dur” (dispensable).

It can be learned from Table 1 that ~23% of respondents show dire financial conditions which force them to desperately seek financial supports from the co-location community. From another angle--independent of the previous observation--about 26% of the total 336 have received adequate financial benefits while participating in the community, in forms of financial giving, income-generating activities or borrowings.

Data for RH2:

This second data set, provided in Table 2, looks into another aspect of the community: their future prospect following patients' satisfaction after their co-living in there. Following the same logic as presented with data for RH1, the response and predictor variables are as follows.

Response variables: They are categorical variables in the factor “PostTr”, used to observe patients' post-treatment commitment to these co-location clusters. Two variables are “indisp.post” (indispensable) and “disp.post” (dispensable).

Predictor variables: There are two groups of predictors “Expectation” and “ImprovedHealth”, with both being dichotomous. “Expectation” indicates overall assessment of a patient's satisfaction while co-living in the community, having values of “met.exp” (satisfactory) and “unmet.exp” (not satisfactory). “ImprovedHealth” represents a patient's response to whether his or her health conditions improve significantly after living with the community, having values of “yes” and “placebo”.

Table 2 (Data for RH2). Distribution of patients following their perceived long-term commitment against their satisfaction and health improvement

“Expectation”	“ImprovedHealth”	“indisp.post”	“disp.post”
“met.exp”	“yes”	64	12
	“placebo”	173	63
“unmet.exp”	“yes”	7	2
	“placebo”	8	7

Observing Table 2 gains an interesting insight. The majority of patients, up to 75%, indicate a high degree of post-treatment commitment to those community. The percentage is even higher than the rate for patients during their treatment times.

Also, about 93% respond that in general their expectations are met by the co-location mode of living. Nonetheless, regarding the actual health conditions, only one fourth of the respondents report significant health improvement.

Statistical Analysis

This study employs the baseline category logits (BCL) framework for analysis of categorical data. The BCL framework that is used to examine the empirical data sets estimates a multivariate generalized linear model (GLM) in the following form:

$$\mathbf{g}(\boldsymbol{\mu}_i) = \mathbf{X}_i \boldsymbol{\beta},$$

where, $\boldsymbol{\mu}_i = E(\mathbf{Y}_i)$, corresponding to $\mathbf{y}_i = (y_{i1}, y_{i2}, \dots)'$; row h of the model matrix \mathbf{X}_i for observation i contains values of independent (also, predictor) variables for y_{ih} .

Due to this set-up of the problem, and as $\pi_j(\mathbf{x}) = P(Y = j|\mathbf{x})$ represent a fixed setting for independent variables, with $\sum_j \pi_j(\mathbf{x}) = 1$, categorical data are distributed over J categories of Y as either binomial or multinomial with corresponding probabilities $\{\pi_1(\mathbf{x}), \dots, \pi_j(\mathbf{x})\}$. Thus, the BCL model aligns each dependent (response) variable with a baseline category: $\ln[\boldsymbol{\pi}_j(\mathbf{x})/\boldsymbol{\pi}_j(\mathbf{x})]$, with $j = 1, \dots, J - 1$.

As $\ln[\boldsymbol{\pi}_a(\mathbf{x})/\boldsymbol{\pi}_b(\mathbf{x})] = \ln[\boldsymbol{\pi}_a(\mathbf{x})/\boldsymbol{\pi}_j(\mathbf{x})] - \ln[\boldsymbol{\pi}_b(\mathbf{x})/\boldsymbol{\pi}_j(\mathbf{x})]$, the set of empirical probabilities from binomial and/or multinomial logits $\{\boldsymbol{\pi}_j(\mathbf{x})\}$ can be computed using the formula:

$$\boldsymbol{\pi}_j(\mathbf{x}) = \frac{\exp(\alpha_j + \boldsymbol{\beta}_j^T \mathbf{x})}{1 + \sum_h^{J-1} \exp(\alpha_h + \boldsymbol{\beta}_h^T \mathbf{x})}.$$

The categorical variables used in our models are dichotomous (e.g., the variate "DuringTrmt" has value of "indisp.dur" and "disp.dur"), thus practically making the analysis logistic regressions. The coded names and values for those dichotomous variables are described in the corresponding data sets in the preceding sections of data sets (Table 1 and Table 2).

A full account of technical details and practical estimations are given in [20] and [4]. (For those are interesting in another possible alternative for modeling the data, the method of log-linear analysis, may refer to the real-world example provided in [21].)

Results

Estimations for examining the above RH1 and RH2 are reported in Table 3 and Table 5. Reported coefficients and related statistics are evaluated using the statistical package R (v.3.2.3).

Estimation and results for RH1:

Table 3 provides results of our investigation into possible relationship between financial needs, received benefits and patients' short-term commitment--mostly limited to their treatment periods--to the co-location clusters under consideration.

Table 3. Estimated coefficients and related statistics/significance for RH1

	Intercept	"Need.fin"	"Ben.fin"
		"urg.fin"	"met.fin"
	β_0	β_1	β_2
logit(indisp.dur disp.dur)	0.581*** [3.891]	-0.546 ^c [-1.880]	2.353** [4.903]
Signif. codes: 0 '***', 0.001 '**', 0.01 '*', 0.05 'c'; z-value in square brackets; baseline category for "Need.fin": "nonurg.fin"; and, "Ben.fin": "unmet.fin". Residual deviance: 6.33 on 1 degree of freedom.			

All estimated coefficients are statistically significant at the conventional levels ($p < 0.05$), suggesting a significant relationship between predictor and response variables. But the effects caused by financial needs

and received benefits appear to be opposite as: $\beta_1 < 0; \beta_2 > 0$. The largest coefficient is: $\beta_2 = +2.353$. The magnitudes of intercept and of the effect of desperate financial needs are almost the same, but showing different signs, (+) and (-) respectively.

Eq. (RH1) reflects on the resulted coefficients from Table 3:

$$\ln\left(\frac{\pi_{\text{indisp.dur}}}{\pi_{\text{disp.dur}}}\right) = 0.581 - 0.546 \times \text{UrgFin} + 2.353 \times \text{MetFin} \quad \text{Eq. (RH1)}$$

From Eq. (RH1) enables us to as the type of questions: "If a patient that is in dire financial pressure and his/her financial needs are satisfied with co-living in the community, then what is the probability that the person will be sticking to the community until his/her medical treatments are completed?"

The computing of $\pi_{\text{indisp.dur}}$, under the conditions of both "urg.fin" and "met.fin", yields an answer for the question:

$$\pi_{\text{indisp.dur}} = \frac{e^{(0.581-0.546+2.353)}}{1 + e^{(0.581-0.546+2.353)}} = 0.916$$

There is a 91.6% probability that the patient will be sticking around as the community is now perceived as "indispensable" for the patient's life. A full set of conditional probabilities following the same type of question is provided in Table 4.

Table 4. Sets of probabilities conditional upon financial expectation and reported satisfaction

"DuringTrmt"	"indisp.dur"		"disp.dur"	
"Need.fin" "Ben.fin"	"met.fin"	"unmet.fin"	"met.fin"	"unmet.fin"
"urg.fin"	0.916	0.509	0.084	0.491
"nonurg.fin"	0.950	0.641	0.050	0.359

Those who have received significant financial benefits, in different forms, from the community show a much stronger propensity to stay committed than those who do not. The difference is staggering, from 30 to 40 percentage points. Fig. 1 visualizes the empirical probabilities given in Table 4.

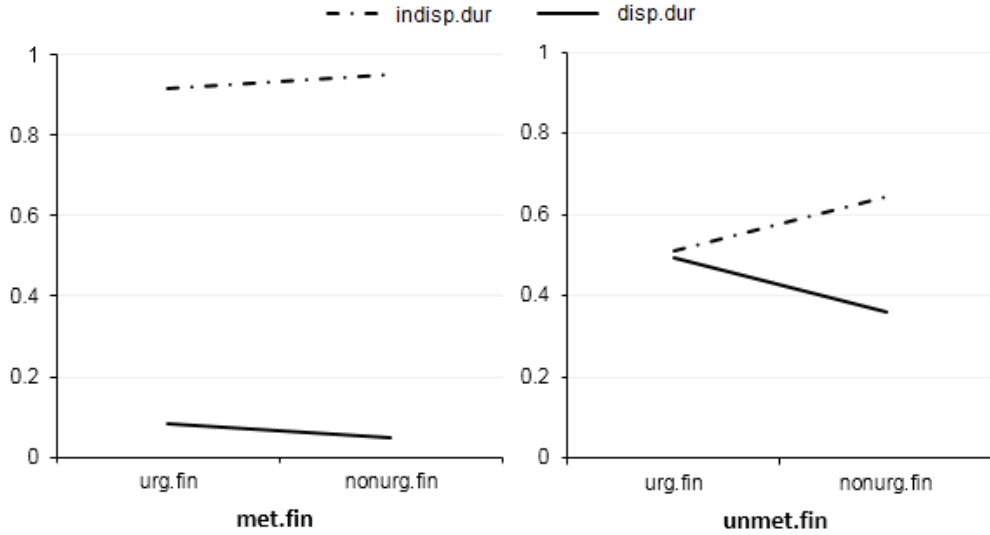


Figure 1. Differences of empirical probabilities of short-term commitment upon conditions of urgent financial needs and (dis)satisfactory financial benefits from the community

Estimation and results for RH2:

The results reported in Table 5 are estimated using data in Table 2. They help examine the effect of meeting patients' expectation and health outcomes after treatment on their longer-term commitment and contribution to the community. The reference category for “Expectation” is “unmet.exp” while for “ImprovedHealth” being “yes”. As we use the conventional level of significance 5%, all coefficients are statistically significant. $\beta_1 < 0$; $\beta_2 > 0$, and these two have similar magnitude (~ 0.7).

Table 5. Estimation results for RH2 investigation

	Intercept	“Expectation” “unmet.exp”	“ImprovedHealth” “yes”
	β_0	β_1	β_2
logit(indisp.post disp.post)	1.000*** [6.891]	-0.743 ^c [-1.649]	0.720* [2.194]
Signif. codes: 0 ‘***’, 0.001 ‘**’, 0.01 ‘*’, 0.05; z-value in square brackets; baseline category for: “Expectation”: “met.exp”; and, “ImprovedHealth”: “placebo”. Residual deviance: 0.21 on 1 degree of freedom.			

Generally speaking, the results confirm a common-sense understanding about the patients' motivation prior to participating in those co-location clusters: unmet needs contribute to reduce probabilities of long-term commitment while improved health conditions help increase commitment.

The empirical relationship is provided in Eq. (RH2), using estimated coefficients from Table 5.

$$\ln\left(\frac{\pi_{\text{indisp.post}}}{\pi_{\text{disp.post}}}\right) = 1.000 - 0.743 \times \text{UnmetExp} + 0.720 \times \text{Yes} \quad \text{Eq. (RH2)}$$

Eq. (RH2) enables the computing of such probability as conditional on values of “unmet.exp” and “yes” as follows:

$$\pi_{\text{disp.post}} = 1 - \frac{e^{(1.000-0.743+0.720)}}{1 + e^{(1.000-0.743+0.720)}} = 0.273$$

The above particular result suggests that there is a 27.3% probability that a patient who experiences significant health improvement without satisfactory benefits from the community will not be committed to the community after his/her medical treatments are completed.

Similar computations are summarized in Table 6, providing a set of conditional probabilities under different circumstances, following the empirical data set.

Table 6. Sets of long-term commitment probabilities conditional upon health outcomes and degree of satisfaction given the expectation from the community

"PostTr"	"indisp.post" (a)		"disp.post" (b)	
"Expectation" "ImprovedHealth"	"yes"	"placebo"	"yes"	"placebo"
"unmet.exp"	0.727	0.564	0.273	0.436
"met.exp"	0.848	0.731	0.152	0.269

Fig. 2 helps visualize the computed values given in Table 6. The trends are similar within each category of propensity to stay committed to the community (left) or not (right). However, the between the two control values indicating patients' commitment, the trends are reverse, and the positions of the two lines (dash for significant improvement effect and solid for placebo effect) swap.

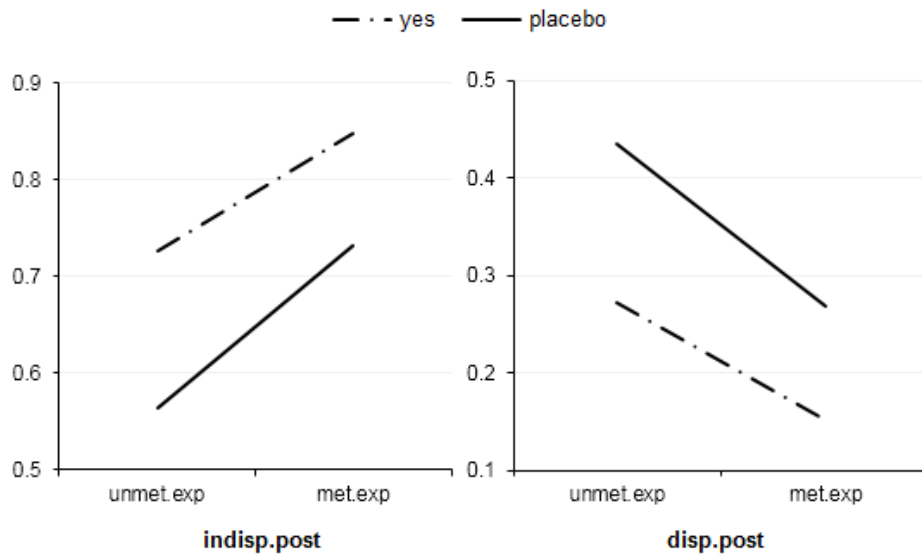


Figure 2. Changes in probabilities of being committed to the communist after treatments, following degree of satisfaction and health improvement.

(In the same vein, Appendix B provides a data set that replaces the financial expectation by in-kind benefits, for which the in-kind benefits show similar effect to the expectation in RH1.)

Discussion

The above observations lead to some non-trivial insights about the future of these co-located patients communities based on the perceptions and evaluations reported by patients. They are summarized in what follow.

Patients who choose to live in those co-location clusters and face financial hardships tend to be sticking to the community at least in the short run, that is within their medical treatment periods. Most understand there will be uncertainties and unexpected medical costs for patients. An important form of financial resources for them is opportunity to work while being treated; and in fact, these opportunity are not always available, let alone the fact about low pay.

Nonetheless, despite their expectations of having income-generating jobs with help from the community, actual financial benefits generally cannot meet their needs. Financials are preferred to in-kind benefits, according to a general view by patients living in those clusters. That is why the level of financial benefits will be decisive for their commitment to the community, at least during the treatment phase.

Despite all limitations of such voluntary communities of co-located patients, having actual experiences living in there as a patient does suggest real values in improving health conditions of desperate patients and to a certain extent meet their expectations. Their experiences with those co-location clusters improve the sense of social benefits and mutual dependence. Patients will also tend to stay connected to, and most probably support, the community even though their medical treatments are completed.

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Competing interests: The author declares that he has no competing interests in pursuing this research.

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Appendix

Appendix A. R code for estimating coefficients in examining research hypotheses (R release 3.2.3)

<p>For research hypothesis #1</p> <pre>> RH1=read.csv("D:/DrVuong/xombenhnhan/Data/Data336/tab.21.31.41.csv",header=T) > attach(RH1) > contrasts(RH1\$Need.fin)=contr.treatment(levels(RH1\$Need.fin),base=1) > contrasts(RH1\$Ben.fin)=contr.treatment(levels(RH1\$Ben.fin),base=2) > fit.RH1=glm(cbind(indisp.dur,disp.dur)~Need.fin+Ben.fin,data=RH1,family=binomial) > summary(fit.RH1)</pre>
<p>For research hypothesis #2</p> <pre>> RH2=read.csv("D:/DrVuong/xombenhnhan/Data/Data336/tab6.113.42.csv",header=T) > attach(RH2) > contrasts(RH2\$ImproveHealth)=contr.treatment(levels(RH2\$ImproveHealth),base=2) > contrasts(RH2\$Expectation)=contr.treatment(levels(RH2\$Expectation),base=1) > fit.RH2=glm(cbind(indisp.post,disp.post)~Expectation+ImproveHealth,data=RH2,family=binomial) > summary(fit.RH2)</pre>

Appendix B. Additional consideration effect of benefits, in-kind and financial, on patients' long-term commitment (post-treatment) to patients community

B1. Data set

"Ben.fin"	"Ben.ikd"	"indisp.post"	"disp.post"
"met.fin"	"met.ikd"	17	8
	"unmet.ikd"	61	1
"unmet.fin"	"met.ikd"	34	39
	"unmet.ikd"	140	36

B2. Estimation for examining effect of in-kind and financial benefits to patients' long-term commitment

	Intercept	"Ben.fin"	"Ben.ikd"
		"met.fin"	"met.ikd"
	β_0	β_1	β_2
logit(indisp.post disp.post)	1.438*** [7.734]	1.464*** [3.677]	-1.698*** [-6.037]
Signif. codes: 0 '***'; z-value in square brackets; baseline category for: "Ben.fin": "unmet.fin"; and, "Ben.ikd": "unmet.ikd". Residual deviance: 3.67 on 1 degrees of freedom.			

B3. Computed conditional probabilities

"PostTr"	"indisp.post"		"disp.post"	
"Ben.fin" "Ben.ikd"	"met.ikd"	"unmet.ikd"	"met.ikd"	"unmet.ikd"
"met.fin"	0.769	0.948	0.231	0.052
"unmet.fin"	0.435	0.808	0.565	0.192