

Economic Evaluation of an Occupational Mental Health Program: Decision Analysis of Salary Compensation and Medical Expenses

Yoko Kono¹⁾ and Takashi Hosaka²⁾

¹⁾Tokyo Medical and Dental University Graduate School

²⁾Tokai University School of Medicine

Abstract

We investigated the effects of an occupational mental health program, which was introduced into Company A since April 2002, by decision analysis of medical expenses and total salary compensation. The number of employee who developed depression increased from 41 to 133 comparing both three years. As a result, total salary compensation increased from ¥189,358 to ¥377,329 (thousand), and medical expenses increased from ¥22,160 to ¥42,589 (thousand), which means the Benefit/Cost was (-) 19.6. Since this extreme increase in cases reflected a socially unusual condition (economical depression), we estimated the cost if the Program had not been introduced. It revealed that the total salary compensation would have been from ¥189,358 to ¥614,258 (thousand), and the medical expenses would have increased from ¥2,216 to ¥71,884 (thousand). Therefore, the benefit/cost ratio would have been 24.6, which demonstrated that this program is excellent from the economical viewpoints. In this study, we evaluated only absenteeism or direct cost such as salary compensation and medical expenses. However, a further study needs to be done including presenteeism or indirect cost derived from impaired performance due to major depressive disorder.

Key words: decision analysis, medical expenses, salary compensation, mental health

❖ Introduction

Since the end of bubble economy in early 90s, there has been a drastic change of working condition in Japan. In those days, there were a lot of companies which have abolished the former Japanese style of work system such as lifetime employment, seniority wage systems, and etc. Alternatively, most of them adopted the result-oriented principle and the management by objectives which had been unfamiliar in Japan, followed frequently by Merger and Acquisition. According to the increase of stress in workplace, there is increasing number of articles indicating the relationship between work stress and development of

depressive disorders in Japan^{1,2)}. The worst result is 'Karojisatsu (in Japanese)' meaning suicide due to overwork, which can be known as a Japanese word even in foreign countries³⁾.

In addition, there have already been a lot of articles investigating the economical effects of depression in workplace. Riotto, M. investigated the both direct and indirect costs of depression among employees⁴⁾. Birnbaum HG compared the both direct and indirect costs of depression between male and female employees, and found that the cost for female depressed employees was higher than those for male⁵⁾. Moreover, Kessler RC, *et al.* examined the effects of chronic medical conditions on work loss, and revealed that the work loss due to depressive disorders was higher than the others⁶⁾.

On the other hand, there is little research in Japan concerning economical loss due to mental illnesses. Therefore, we investigated the direct economical

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Corresponding: Y. Kono, Tokyo Medical and Dental University, 1-5-45 Yushima, Bunkyo-ku, Tokyo 113-8510, Japan
e-mail: liaison21@mac.com

Table 1 Mental health before and after introduction of the program

	Pre-	Post-Program
Duration	April 1999 – March 2002	April 2002 – March 2005
Primary Prevention Program	none	Seminars for managers and Administrative Staff
Secondary Prevention program (early detection & treatment)	Guidance by a Occupational Nurse	Administration of mental health check sheet through intranet
	Distribution of a Pamphlet	Counselling by an Occupational Counsellor
Tertiary Prevention Program (diagnosis & treatment)	Referral by a Occupational Nurse or Non-psychiatric company doctor to medical facilities	Referral to a part-time company psychiatrist
Rehabilitation	Restoration only through doctor-in-charge outside company	Collaboration among doctor-in-charge, part-time company psychiatrist and non-psychiatric full-time company doctor. A reinstatement support program participated by an employee, a company doctor, a human resource staff, and a manager

effects of depression by cost-benefit analysis using medical expenses and total salary compensation.

❖ Studied Population and Methods

The Company A, which had 2,400 full-time employees, has introduced an occupational mental health program in April 2002. This occupational mental health program included primary prevention by mental health seminars, early detection of mental health problem by an occupational counselor, referral to mental health facilities, and a reinstatement support program recommended by the Ministry of Health, Labor and Welfare⁷⁾.

Before that, the Company A had no specific program of mental health and has dealt with the sick leave case with mental health problems as same as case with other reasons. The numbers of mentally ill employees have been increasing after 2000, when the result oriented principle and the management by objectives were introduced into the Company A. The abrupt increase of sick leave employees by mental problems was recognized. Considering this situation, Company A started this new Program including primary prevention by mental health seminars, early detection of mental health problem by an occupational counselor, referral to mental health facilities, and a reinstatement support program. Table 1 demonstrates how

mental problems are dealt with for Pre-Program three years (from April 1999 until March 2002) and Post-Program three years (from April 2002 until March 2005).

In order to investigate the effectiveness of this program, we compared the cost which was paid for depressed employees between Pre-Program three years and Post-Program three years using a cost-benefit analysis⁸⁾. The calculation of cost and benefit were done as follows;

Benefit by applying Program A (estimated)

= Losses (measured during Program A) – Losses (estimated)

Net benefit (estimated)

= Benefit by applying Program A (estimated) – Cost increase

Benefit/Cost Ratio (estimated)

= Net benefit (estimated) / Cost increase (estimated)

Here, evaluated costs were salary compensation allowance and cost of the program (charged base).

The employees who had developed mental problems prior to the Pre-Program three years were excluded from this analysis.

❖ Results

Table 2 demonstrates the demographic data of

Table 2 Background of mentally ill employees

	Pre-	Post-Program	Total
Sex			
male	37	124	161
female	9	70	79
Age			
20–24	1	28	29
25–29	13	64	77
30–34	17	44	61
35–39	8	36	44
40–44	6	15	21
45–49	0	7	7
50<	1	0	1
Years of Employment			
0–4	16	109	125
5–9	15	27	42
10–14	9	36	45
15–19	4	17	21
20–24	1	4	5
25–29	1	1	2
Marital state			
single	30	127	157
married	14	66	80
divorced	2	1	3
Mental disorders according to DSM-IV			
Mental disorders according to physical conditions	0	4	4
Substance-related disorders	0	1	1
Schizophrenia	0	1	1
Affective disorders	27	119	146
Anxiety disorders	5	19	24
Somatoform disorders	11	28	39
Sleep disorders	2	5	7
Adjustment disorders	0	2	2
Personality disorders	1	5	6
Others	0	10	10

mentally ill employees during the 3 years periods of pre- and post-Program, which was demonstrated in the previous study⁹). Thirty-seven males and 9 females developed mental problems during the Pre-Program period, while 124 males and 70 females in Post-Program period. Between the two periods, male cases increased 3.5 times and female cases increased 7.8 times. In terms of the age, there are much more young employees who had mental problems in the Post-Program period. More cases were recognized among the employees with shorter duration of employment (0–4 years). According to the DSM-IV,

the most frequent disease was affective disorders, followed by somatoform disorders and anxiety disorder.

First, we investigated the effect of the Program on the work loss days. Comparing both three years of pre- and post-Program, the number of employee who developed mental disorders increased from 41 to 133 as indicated in Figure 1. However, the work loss days significantly shortened from 786 to 305 days ($p < 0.01$).

In this analysis, the total cost for programs were calculated as a sum of costs for human resources and facilities. Its cost was increased ¥11,175 (thousand)

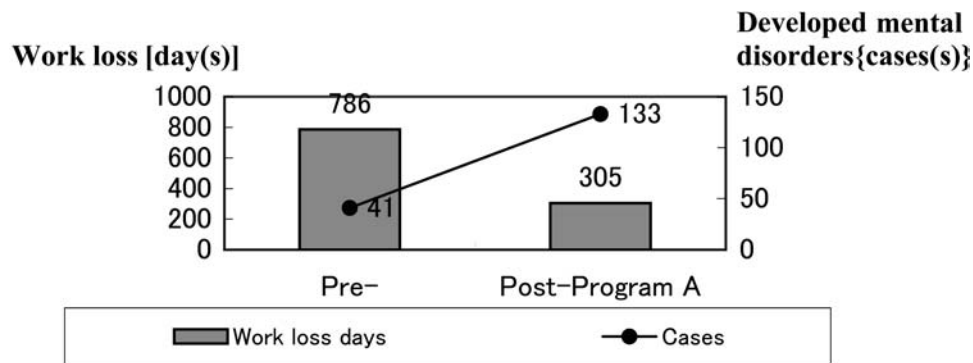


Figure 1 Work loss and cases before and after introducing Program A

Table 3 Cost analysis between pre- and post-program A

	Pre- Program A	Post- Program A	Cost increase	Benefit	Net benefit	Benefit/Cost Ratio
Total cost for program [$\times 1,000$ JPY]	25,800	36,975	11,175			
Number of cases	41	133				
Losses (negative profits) [$\times 1,000$ JPY]	211,518	419,918		-208,400	-219,575	-19.65
Salary compensation [$\times 1,000$ JPY]	189,358	377,329		-187,971		
Medical cost [$\times 1,000$ JPY]	22,160	42,589		-20,429		
Salary compensation/case [$\times 1,000$ JPY]	4618 \pm 2456	2837 \pm 2166				
Medical cost/case [$\times 1,000$ JPY]	540 \pm 278	320 \pm 260				
Total cost/case [$\times 1,000$ JPY]	5159 \pm 2702	3157 \pm 2410				

Benefit = Pre-Program A Loss – Post-program A Loss

Net benefit = Benefit – Cost increase

Benefit/Cost = Net benefit / Cost increase

between the two kinds of mental health intervention, as indicated in Table 3. Between these two periods, there were a lot of employees who developed mental disorders partly because of extreme overwork, the result-oriented principle and the management by objectives followed frequently by Merger and Acquisition, which had been unfamiliar in Japan¹⁰. In fact, the number of employee who developed mental disorders increased from 41 to 133 comparing both three years of pre- and post-Program, as indicated in Figure 1 and Table 3. As a result, total salary compensation increased from ¥189,358 to ¥377,329 (thousand), and medical expenses increased from ¥22,160 to ¥42,589 (thousand). The total benefit was calculated to be (–)¥208,400 (thousand). The net benefit was added by the increased cost for a new program, and became (–)¥219,575 (thousand). This means the Benefit/Cost was (–)19.6, which was calculated as (–)¥219,575/11,175.

Calculating the cost per each case demonstrates that total salary compensation decreased from ¥4,618 \pm 2,456 (thousand) to ¥2,837 \pm 2,166 (thousand), and medical expenses decreased from ¥540 \pm 278 (thousand) to ¥320 \pm 260 (thousand). In short, the total cost for each case markedly decreased from ¥5,159 \pm 2,702 (thousand) to ¥3,157 \pm 2,410 (thousand). This means that introduction of this new program succeeded in suppressing to be 61% in both total salary compensation and in medical expenses.

The reason why that the Benefit/Cost was (–)19.6 is that the cases extremely increased in the post-Program comparing pre-Program. Then, we estimated the cost if the Program had not been introduced, which revealed the total salary compensation would have been from ¥189,358 to ¥614,258 (thousand), and the medical expenses would have been from ¥22,160 to ¥71,884 (thousand) according to the increase of the cases. Therefore, the benefit by introduction of the

Table 4 Cost benefit analysis between with and without Program A

	Pre- Program A (measured)	→	w/o- Program A (estimated)	Post- Program A (measured)	Cost increase	Benefit by applying- Program A (estimated)	Net benefit (estimated)	Benefit/ Cost Ratio (estimated)
Total cost for program [×1,000JPY]	25,800		25,800	36,975	11,175			
Number of Cases	41	→	133	133				
Losses (negative profits)	211,518	→	686,144*	419,918		266,226	255,051	22.82
Salary compensation [×1,000JPY]	189,358	→	614,259*	377,329		236,930		
Medical cost [×1,000JPY]	22,160	→	71,885*	42,589		29,296		

Benefit by applying Program A (estimated) = Losses (measured during Program A) – Losses (estimated)

Net benefit (estimated) = Benefit by applying Program A (estimated) – Cost increase

Benefit/Cost Ratio (estimated) = Net benefit (estimated) / Cost increase (estimated)

(*) Estimated Benefits (Losses) are introduced by multiplying “Estimation Factor F (**)” to values of Pre-Program A for comparing between Program A is applied or not

(**) F is introduced following formula; $F = (\text{Number of Cases developed during post-Program A period}) / (\text{Number of Cases developed pre-Program A period}) = 133/41 = 3.24$ (approx)

Program would have been ¥253,899 (thousand) for the total salary compensation and ¥31,741 (thousand) for the medical expenses, respectively. Then the net benefit would have been ¥274,465 (thousand) (= benefit – cost increase), and the benefit/cost ratio would have been 24.6.

❖ Discussion

There are several methods to make an economical evaluation for mental health program such as Cost-Effectiveness Analysis (CE), Cost-Utility Analysis (CUA) including Quality-Adjusted Life Year (QALY), Cost-Benefit Analysis (CBA) and etc. In this study, we used decision analysis because this analysis would be simple if the cost for program and the benefit by the program were taken¹¹⁾. It is generally true that mental health program have not been economically evaluated especially in Japan. Therefore, this study is significant in the field of clinical psychiatry and occupational/industrial psychology.

According to the results of this study, we would like to discuss as follows.

First, in this study, the cost of this program included only salary for human resources, because psychological interview and counseling were undertaken in a company, and because mental health checklist was developed by the company itself (a software maker) and provided through the Intranet in the com-

pany. But, the cost should include all cost such as information cost, depreciation of the PCs, personnel fee for preparing the Intranet program, and etc.

Second, according to the study by Nordqvist *et al.*, the work loss day was 79 days¹²⁾. Also, Kessler RC. reported that the major depressive disorder was associated with 27.2 lost work days per ill worker¹³⁾. This study demonstrated that introduction of a new program reduced the work loss days from 786 to 305, which means 38.8% reduction. However, it is still longer than the duration in the above mentioned studies. The major reason is that this company and its health insurance organization, although it is common in almost all companies in Japan, are providing highly welfare for the employees such as an extremely long paid sick leave. In this study, many employees are provided paid sick leave longer than two years. However, this traditional welfare is gradually changing. Anyhow, this result might indicate that this Program is to be more modified.

Third, the salary compensation and the medical expenses paradoxically increased after this program started, which was partly because the program promoted early detection. However, such a huge increase was clearly associated with an extreme increase of depressed employees in almost all Japanese companies according to economical depression. Therefore, in this study, we estimated the cost using the increased number of mentally ill employees when assuming that

the company did not introduce a new program. According to the CBA using the estimated numbers, the total salary compensation would have been from ¥189,358 to ¥614,258 (thousand), and the medical expenses would have been from ¥22,160 to ¥71,884 (thousand). Therefore, the benefit/cost ratio would have been 24.6, which demonstrated that this program was excellent from the economical point of view.

Finally, in this study, we evaluated only absenteeism or direct cost such as salary compensation and medical expenses. However, a further study needs to be done including presenteeism or indirect cost derived from impaired performance due to major depressive disorder¹⁴⁻¹⁶.

❖ References

- 1) Kawakami N, Haratani T: Epidemiology of job stress and health in Japan: review of current evidence and future direction. *Ind Health* 37 (2), 174–186 (1999).
- 2) Wada K, Moriyama M, Narai R, *et al.*: The effect of chronic health conditions on work performance in Japanese companies [Article in Japanese] *Sangyo Eiseigaku Zasshi* 49 (3), 103–109 (2007).
- 3) Amagasa T, Nakayama T, Takahashi Y: Karojisatsu in Japan: characteristics of 22 cases of work-related suicide. *J Occup Health* 47 (2), 157–164 (2005).
- 4) Riotto M: Depression in the workplace: negative effects, perspective on drug costs and benefit solutions. *Benefits Q* 17 (2), 37–48 (2001).
- 5) Birnbaum HG, Leong SA, Greenberg PE: The economics of women and depression: an employer's perspective. *J Affect Disord* 74 (1), 15–22 (2003).
- 6) Kessler RC, Greenberg PE, Mickelson KD, *et al.*: The effects of chronic medical conditions on work loss and work cutback. *J Occup Environ Med* 43 (3), 218–225 (2001).
- 7) http://www2.mhlw.go.jp/kisya/kijun/20000809_02_k/20000809_02_k_shishin.html
- 8) Udvarhelyi IS, Colditz GA, *et al.*: Cost-effectiveness and cost-benefit analyses in the medical literature. *Ann Intern Med* 116 (3), 238–244 (1992).
- 9) Kono Y, Hosaka T: Effects of an occupational mental health program on sick leave duration, restoration and contract termination rates. *Asian Pacific Journal of Disease Management* 1 (2), 77–81 (2007).
- 10) Kawakami N, Haratani T: Epidemiology of job stress and health in Japan: review of current evidence and future direction. *Ind Health* 37 (2), 174–186 (1999).
- 11) Koplan JP, Schoenbaum SC, Weinstein MC, *et al.*: Pertussis vaccine—an analysis of benefits, risks and costs. *N Engl J Med* 301 (17), 906–911 (1979).
- 12) Holmqvist NC, Alexanderson K: Views of laypersons on the role employers play in return to work when sick-listed. *J Occup Rehabil* 13, 11–20 (2003).
- 13) Kessler RC, Akiskal HS, Ames M, *et al.*: Prevalence and effects of mood disorders on work performance in a nationally representative sample of U.S. workers. *Am J Psychiatry* 163 (9), 1561–1568 (2006).
- 14) Brouwer WB, van Exel NJ, Loopmanscap MA, *et al.*: Productivity costs before and after absence from work: as important as common? *Health Policy* 61 (2), 173–187 (2002).
- 15) Hemp P: Presenteeism: at work-but out of it. *Harv Bus Rev* 82 (10), 49–58, 155 (2004).
- 16) Adler DA, McLaughlin TJ, Rogers WH, *et al.*: Job performance deficits due to depression. *Am J Psychiatry* 163 (9), 1569–1576 (2006).