



MAFEIP

Support Services for the Management and Utilization of
Monitoring and Assessment of the EIP - MAFEIP Tool

MasterMind. cCVC.

**Badalona Serveis Assitencials
(BSA)**

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Executive summary

Description of the intervention

The objective of the MasterMind project¹ is to make high quality treatment for depression more widely available for adults suffering from the illness through the use of ICT. This analysis focuses on the trial of the service cCVC in Badalona Serveis Assistencials (BSA), a public health and social care provider operating in the most populated suburban area of Barcelona (Spain). The Video conference for Collaborative Care and treatment of depression (cCVC) is targeted at patients aged 18 or older diagnosed by Major Depressive Disorder (MDD) within mild to moderate states. The objective is to use video conference services and networks to facilitate the cooperation between specialists and GP²s in the treatment of depression. During the intervention, patients completed between 2 and 4 sessions. The age of the participants in BSA ranged from 22 to 74 years old and there were more females (63%) than males (37%). The evaluation used a pre-trial-post-trial study design and it followed the dimensions of the Model for Assessment of Telemedicine (MAST) (Kidholm et al., 2012)³.

Model input

Defining the health states and the transition probabilities

The health states are based on the symptoms of depression. Concretely, having no symptoms of a Major Depressive Disorder (MDD) represents the baseline health, and having symptoms, regardless of the severity, the deteriorated state. After the intervention, 33 out of the 74 who were initially in the deteriorated state showed not symptoms. Therefore, the recovery rate is 45% (Table 1). The recovery rate for the control group is obtained from the scientific literature, concretely from trials that assessed the effect of medication in the treatment of depression at 16 weeks. Similarly, the incidence rate comes from a literature review that found a pooled estimate of the MDD annual incidence equal to 3%⁴. Incidence is the same for the control and the intervention group because the intervention's target is to cure those that have depression, not to prevent new cases. Finally, the relative risk (RR) of mortality for the deteriorated state (1.92) is extracted from a systematic review and meta-analysis of excess mortality in population-based studies of clinically defined depression⁵. For the baseline we keep the default value of 1, since people in this state do not have depressive symptoms (Table 1).

Computing the costs

The intervention one-off costs for the cCVC service include the support given to therapists to implement the services in their daily routine, the ICT infrastructure, and the training for users. These costs were divided by the number of patients that started the intervention, 81, which produced a value of 790€ per patient. The costs of cCVC sessions were estimated to be 128€

¹ <https://mastermind-project.eu>

² General Practitioner

³ Kidholm, K., Pedersen, C. D., Jensen, L. K., Ekeland, A. G., Bowes, A., Flottorp, S., & Bech, M. (2012). A model for assessment of telemedicine applications – MAST. *International Journal of Technology Assessment in Health Care*, 28(1), 44–51.

⁴ Ferrari, A. J., Charlson, F. J., Norman, R. E., Flaxman, A. D., Patten, S. B., Vos, T., & Whiteford, H. A. (2013). The Epidemiological Modelling of Major Depressive Disorder: Application for the Global Burden of Disease Study 2010. *PLoS ONE*, 8(7).

⁵ Baxter, A. J., Page, A., & Whiteford, H. A. (2011). Factors influencing risk of premature mortality in community cases of depression: A meta-analytic review. *Epidemiology Research International*, 2011, 1–12.

(direct costs plus overheads) and they were multiplied by three, the average number of sessions that patients completed. These costs affect exclusively individuals in the deteriorated state, because only those with depressive symptoms follow the treatment. Therefore, we include them under healthcare costs, since this section distinguishes between states. In addition, we add them in the one-off section, which computes the cost of the first cycle, because all participants in MasterMind started with depression symptoms. In consequence, the value for the one-off costs is 1,174 € (Table 1).

Healthcare costs refer to resource use within the healthcare system. Since the MasterMind project did not compute these costs, they are obtained from a study on the MDD in Spain⁶. In this study, healthcare costs for patients in remission (baseline state) were estimated to be 451€ and for those not in remission (deteriorated state), 826€. Due to the fact that we cannot estimate the impact of the intervention on healthcare costs, we assume that these are the same for the control and intervention, and that they only vary depending on the health state. We add, however, the costs of cCVC sessions in the section of the deteriorated state for the intervention group, which gives a value of 1,210€. Furthermore, in the deteriorated health state of the control group we add the usual care equivalent cost of the cCVC sessions, assuming that when patients have one cCVC session they save a normal session with their GP plus one with the specialist (the two professionals that participate in the collaborative care videoconferencing). From Sicras-Mainar et al. (2012), we obtain the visit cost, which are multiplied by 3, the number of cCVC sessions. The final healthcare cost for this group is 1,183 € (Table 1). The societal costs, which add to the healthcare costs the loss of labour productivity due to sick leave, are also obtained from the same study.

Utility

MasterMind assessed Quality of Life through the variable *Satisfaction with life*⁷ using a 7-point Likert scale. These are mapped into a 0-1 range in order to adapt them to MAFEIP. The values collected before treatment represent the control scenario (the situation in which no intervention had been implemented). On the other hand, the values collected after the MasterMind pilots are the intervention values, this is, the ones influenced by the new services. The utility before the implementation of the cCVC was 0.50 for those that had no symptoms (baseline health) and 0.35 for those with depressive symptoms (deteriorated state). Satisfaction with life was higher after the intervention for both the baseline state (0.66), and the deteriorated one (0.41) (Table 1).

⁶ Sicras-Mainar, A., Mauriño, J., Cordero, L., Blanca-Tamayo, M., & Navarro-Artieda, R. (2012). Costes y factores asociados a las respuestas óptima y subóptima al tratamiento del trastorno depresivo mayor en atención primaria. *Atencion Primaria*, 44(11), 667–675.

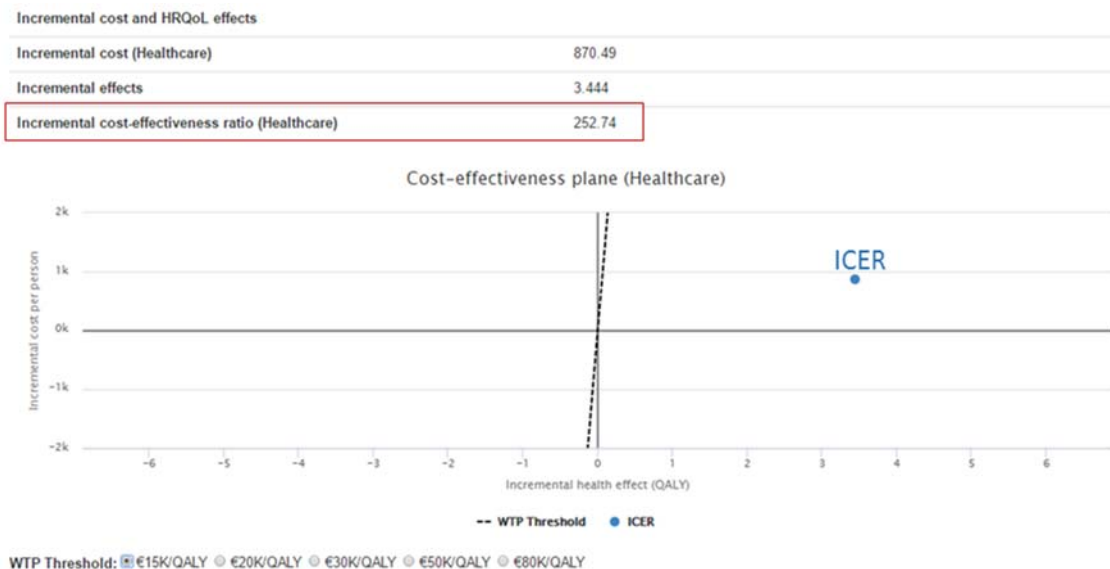
⁷ How satisfied are you with your life as a whole today?

Table 1. Input data used to populate the MAFEIP model

	Control Group	Intervention Group
Transition Probabilities		
Incidence	3 %	3 %
Recovery	29 %	45 %
Relative Risk		
Baseline State	1.00	1.00
Deteriorated State	1.92	1.92
Costs		
One-off cost per patient (Intervention)	-	1,174 €
Recurring cost per patient/year (intervention)	-	-
Healthcare cost – Baseline	451 €	451 €
Healthcare cost – Deteriorated	1,183 €	1,210 €
Societal cost – Baseline	1,442 €	1,442 €
Societal cost – Deteriorated	3,025 €	3,052 €
Utility		
Baseline State	0.50	0.66
Deteriorated State	0.35	0.41

Model output

Figure 1 shows the overall impact of the intervention on the costs and effects of the whole target population. The incremental cost-effectiveness ratio (ICER) is placed in the upper-right quadrant, which implies that cost-effectiveness depends on willingness to pay. Concretely, the intervention is cost-effective if the willingness to pay is at least 252.74€ per Quality-adjusted life year (QALY)⁸. Therefore, it is clearly below all the thresholds included in the graph, meaning that the implementation of the cCVC would be acceptable.

Figure 1. Cost-effectiveness


⁸ <https://www.nice.org.uk/glossary?letter=q>

1. Description of the intervention

The objective of the MasterMind project is to make high quality treatment for depression more widely available for adults suffering from the illness through the use of ICT. Despite the availability of effective treatments, the number of people that actually receive treatment for depressive disorders is not optimal. Moreover, unipolar depression is amongst the most prevalent mental disorders around the world, and is associated with a high disease burden and elevated economic and societal costs due to absenteeism, early retirement, loss of productivity and premature death (Ferrari et al., 2013⁹; Kessler, 2007¹⁰; Wittchen et al., 2011¹¹). In the usual care situation, the majority of persons with a mild or moderate depressive disorder receive treatment in primary care settings, mostly from GPs, by means of antidepressants and less by brief psychotherapeutic interventions. Patients suffering from more severe depressive disorders are often referred to specialised mental healthcare services where treatment consists of medication, psychotherapy, or a combination of both.

MasterMind tested two services: cCBT (Guided cCBT for treatment of depression) and cCVC (Video conference for Collaborative Care and treatment of depression), in fifteen pilot sites. This analysis focuses on the trial of cCVC in Badalona Serveis Assistencials (BSA), a public health and social care provider operating in the most populated suburban area of Barcelona (Spain). BSA is one of the frontrunners within the implementation of ICT in the provision of care at all levels and has been doing so for the last 10 years. Collaborative care in BSA was put in place several years ago, but the experience with MasterMind opened a new work group to improve the videoconferencing connection in order to do multicentre videoconferences with other regional entities specialised in Mental Health

The Video conference for Collaborative Care and treatment of depression (cCVC) is targeted at patients aged 18 or older diagnosed by Major Depressive Disorder (MDD) within mild to moderate states. The objective is to use video conference services and networks to facilitate the cooperation between specialists and GPs in the treatment of depression. Patients and GPs access the videoconferencing system at the Primary Care Centres in order to contact the psychiatrists who are in the hospital and provide direct specialist support. The idea is that the specialist deals with the situation while the GP is learning. As a result, patients feel safer and do not need to move to the hospital, which would imply being treated by other healthcare professionals and starting again to explain the personal history and symptoms. During the intervention, patients completed between 2 and 4 sessions, with the average being 3.1 sessions.

The age of the participants in BSA ranged from 22 to 74 years old and there were more females (63%) than males (37%). The evaluation used a pre-trial-post-trial study design and it followed the dimensions of the Model for Assessment of Telemedicine (MAST) (Kidholm et al., 2012)¹².

⁹ Ferrari, A. J., Charlson, F. J., Norman, R. E., Flaxman, A. D., Patten, S. B., Vos, T., & Whiteford, H. A. (2013). The Epidemiological Modelling of Major Depressive Disorder: Application for the Global Burden of Disease Study 2010. *PLoS ONE*, 8(7).

¹⁰ Kessler, D., Lewis, G., Kaur, S., Wiles, N., King, M., Weich, S., ... Peters, T. J. (2009). Therapist-delivered internet psychotherapy for depression in primary care: a randomised controlled trial. *The Lancet*, 374, 628–634.

¹¹ Wittchen, H. U., Jacobi, F., Rehm, J., Gustavsson, A., Svensson, M., Jönsson, B., ... Steinhausen, H. C. (2011). The size and burden of mental disorders and other disorders of the brain in Europe 2010. *European Neuropsychopharmacology*, 21(9), 655–679.

¹² Kidholm, K., Pedersen, C. D., Jensen, L. K., Ekeland, A. G., Bowes, A., Flottorp, S., & Bech, M. (2012). A model for assessment of telemedicine applications – MAST. *International Journal of Technology Assessment in Health Care*, 28(1), 44–51.

2. Model input

2.1. Defining the health states and the transition probabilities

The health states are based on the symptoms of depression, which were measured in the project according to routine practice diagnostic procedures (e.g. PHQ-9, BDI, etc.). Participants were classified in 5 categories: 1 = No symptoms are experienced, 2 = Symptoms are mild, 3 = Symptoms are moderate, 4 = Symptoms are severe, 5 = Symptoms are very severe. The category of no symptoms represents the baseline health and the rest the deteriorated state, that in this case implies having symptoms of a Major Depressive Disorder (MDD).

Before the start of the cCVC pilots, all participants but four had depressive symptoms. After the intervention, 33 out of the 74 who were in the deteriorated state showed not symptoms. Thus, the **recovery rate** is **45%**. MasterMind did not include a control group due to the fact that in these type of studies it may be unethical to intentionally leave some potential participants out. Therefore, we obtain the recovery rate for the control group from the scientific literature. A systematic review and meta-analysis of remission from untreated major depression found that 23% of prevalent cases of untreated depression remit¹³ within 3 months (Whiteford et al., 2013)¹⁴. Moreover, trials that assess the effect of medication in the treatment of depression at 16 weeks found rates of recovery ranging from 23% to 42% (De Jonghe, Kool, Van Aalst, Dekker, & Peen, 2001¹⁵; Dimidjian et al., 2006¹⁶; Kessler et al., 2009¹⁷). We use the average of the values from these studies, **29%**. Furthermore, we will test the range 23-42 in the sensitivity analysis.

There are not enough observations in the baseline health state before starting the treatment to compute the **incidence rate**. Therefore, we also obtain this value from the scientific literature. Concretely, from the literature review conducted by Ferrari et al. (2013)¹⁸ who found a pooled estimate of annual incidence of **3%**. We use the same value for the control and the intervention group because the intervention's target is to cure those that have depression, not to prevent new cases.

The **risk for mortality** might be a bit higher than for the general population because, according to the scientific literature, there is an association between unipolar depression and premature death. For instance, people with major depression and schizophrenia have a 40% to 60% greater chance of dying prematurely than the general population, due to physical health problems left

¹³ Remission was defined as rescinded diagnoses or below threshold scores on standardized symptom measures.

¹⁴ Whiteford, H. A., Harris, M. G., McKeon, G., Baxter, A., Pennell, C., Barendregt, J. J., & Wang, J. (2013). Estimating remission from untreated major depression: A systematic review and meta-analysis. *Psychological Medicine*, 43(8), 1569–1585.

¹⁵ De Jonghe, F., Kool, S., Van Aalst, G., Dekker, J., & Peen, J. (2001). Combining psychotherapy and antidepressants in the treatment of depression. *Journal of Affective Disorders*, 64(2–3), 217–229.

¹⁶ Dimidjian, S., Hollon, S., Dobson, K., Schmalting, K., Kohlenberg, R., Addis, M., ... Jacobson, N. (2006). Randomized trial of behavioral activation, cognitive therapy, and antidepressant medication in the acute treatment of adults with major depression. *Journal of Consulting and Clinical Psychology*, 74(4), 658–670.

¹⁷ Kessler, D., Lewis, G., Kaur, S., Wiles, N., King, M., Weich, S., ... Peters, T. J. (2009). Therapist-delivered internet psychotherapy for depression in primary care: a randomised controlled trial. *The Lancet*, 374, 628–634.

¹⁸ Ferrari, A. J., Charlson, F. J., Norman, R. E., Flaxman, A. D., Patten, S. B., Vos, T., & Whiteford, H. A. (2013). The Epidemiological Modelling of Major Depressive Disorder: Application for the Global Burden of Disease Study 2010. *PLoS ONE*, 8(7).

unattended and suicide (WHO, 2013)¹⁹. Baxter, Page, & Whiteford (2011)²⁰ also conducted a systematic review and meta-analysis of excess mortality in population-based studies of clinically defined depression. They concluded that there is a significantly higher risk of mortality for major depression, with an estimated relative risk (RR) of **1.92**. We input this value for the deteriorated health state for both the control and the intervention groups, since the project did not assess if MasterMind reduced mortality and this was not the service's main goal. For the baseline we keep the default value of **1**, since people in this state do not have depressive symptoms.

2.2. Computing the costs

The intervention one-off costs for the cCVC service include the support given to therapists to implement the services in their daily routine, the ICT infrastructure, and the training for users. One person from BSA was in charge of the technical support and another one of providing training. The salary of such technical staff is approximately (according to the Spanish standards) of 40,000€/year. This was divided by two because they were also in charge of supporting the cCBT service. All the implementation costs were divided by the number of patients that started the intervention, 81. Therefore, the costs amounted to 790€ per patient.

The direct costs of one cCVC session (including therapist salary, licences, service level agreements and maintenance and ICT infrastructure) are estimated to be 95€. Overheads (office rent, gas, heating/cooling, administration etc.) are around 33€ per session. These costs are multiplied by three, the average number of sessions that patients completed. However, since only those with depressive symptoms follow the treatment, these costs should only be counted in the deteriorated state. For this reason, we add them in Table 3 under healthcare costs (which are also expressed in terms of costs per year and person, but allow to distinguish between states). In addition, all participants in MasterMind start with depression symptoms, implying that they receive the treatment. To account for this, we include the sessions' cost also in the one-off section, which computes the cost of the first cycle (Table 2).

¹⁹ WHO. (2013). Mental Health Action Plan 2013-2020. Geneva. Retrieved from http://apps.who.int/iris/bitstream/10665/89966/1/9789241506021_eng.pdf

²⁰ Baxter, A. J., Page, A., & Whiteford, H. A. (2011). Factors influencing risk of premature mortality in community cases of depression: A meta-analytic review. *Epidemiology Research International*, 2011, 1–12.

Table 2. Intervention costs

Intervention one-off costs (per patient)	
Time spent to support therapists to implement the service(s)	247
Training cost	247
ICT infrastructure	296
Direct costs of cCVC sessions	285
Overheads	99
TOTAL	1,174

Healthcare costs refer to resource use within the healthcare system in each situation, usual care and intervention. However, the MasterMind project did not compute these costs. A study focusing on the Major Depressive Disorder in Spain (Sicras-Mainar, Mauriño, Cordero, Blanca-Tamayo, & Navarro-Artieda, 2012) estimated the cost per person and year of patients that were in remission and those that were not. They calculated both healthcare costs (physician visits, hospitalisations, pharmaceuticals, etc.) and indirect costs associated with patients' production losses due to sick leave (i.e. societal costs). Healthcare costs for patients in remission (baseline state) were estimated to be 451€ and for those not in remission (deteriorated state), 826€.

Due to the fact that we cannot estimate the impact of the intervention on healthcare costs, we will assume that these are the same for the control and intervention, and that they only vary depending on the health state. Later, some variations in these costs are applied in the sensitivity analysis. However, we need to add the intervention recurring costs applicable only to the deteriorated state, as explained above. These are **384€** (285€ accounting for the direct costs of cCVC sessions, and 99€ of overheads). Those in the baseline do not incur these costs because they do not have depression symptoms and, thus, they do not need to follow the treatment. Nonetheless, in the deteriorated health state of the control group we need to add the usual care equivalent cost of the cCVC sessions, assuming that when patients have one cCVC session they save a normal session with their GP plus one with the specialist (the two professionals that participate in the collaborative care videoconferencing). From Sicras-Mainar et al. (2012), we obtain the cost per visit to the specialist (96,24€) and to primary care (22,74€). These values are added up and multiplied by 3 (the number of cCVC sessions). In consequence, we get that the equivalent cost of cCVC sessions for usual care is **357€**.

Table 3. Healthcare Costs (per patient and year in €)

Control Group baseline health	
Healthcare costs for depression patients in remission	451
TOTAL	451
Control Group deteriorated health	
Healthcare costs for depression patients not in remission	826
Costs of usual care sessions	357
TOTAL	1,183
Intervention Group baseline health	
Healthcare costs for depression patients in remission	451
TOTAL	451
Intervention Group deteriorated health	
Healthcare costs for depression patients not in remission	826

Costs of cCVC sessions	384
TOTAL	1,210

The societal costs are obtained from the estimations in Sicras-Mainar et al. (2012), for both the intervention and control groups. Their estimates were 991€ for patients in remission and 1,842€ for the ones not in remission. These costs referred to loss of labour productivity due to sick leave (Table 4).

Table 4. Societal Costs (per patient and year in €)

Control Group baseline health	
Cost of sick leave	991
Healthcare costs	451
TOTAL	1,442
Control Group deteriorated health	
Cost of sick leave	1,842
Healthcare costs	1,183
TOTAL	3,025
Intervention Group baseline health	
Cost of sick leave	991
Healthcare costs	451
TOTAL	1,442
Intervention Group deteriorated health	
Cost of sick leave	1,842
Healthcare costs	1,210
TOTAL	3,052

2.3. Utility

MasterMind assessed Quality of Life through the variables *Satisfaction with life*²¹ using a 7-point Likert scale. This was computed before and after treatment, and in four points during treatment. The values in the 7-point Likert scale are mapped into a 0-1 range in order to adapt them to MAFEIP. The values collected before treatment represent the control scenario (the situation in which no intervention had been implemented). On the other hand, the values collected after the MasterMind pilots are the intervention values, this is, the ones influenced by the new services (Table 5). The utility before the implementation of the cCVC was 0.50 for those that had no symptoms (baseline health) and 0.35 for those with depressive symptoms (deteriorated state). Satisfaction with life was higher after the intervention for both the baseline state (0.66), and the deteriorated one (0.41).

Table 5. Utility

	Control	Intervention
Baseline	0.50	0.66
Deteriorated	0.35	0.41

²¹ How satisfied are you with your life as a whole today?

3. Model output

As Figure 2 shows, the intervention is more expensive than the usual care. On the other hand, the cCVC service appears to be more effective than the current care option, implying that it managed to increase patients' quality of life (Figure 3). In consequence, the incremental cost-effectiveness ratio (ICER) is placed in the upper-right quadrant (Figure 4). In this quadrant, cost-effectiveness depends on willingness to pay. In this case, the intervention is cost-effective if the willingness to pay is at least 252.74€ per Quality-adjusted life year (QALY)²². Therefore, it is clearly below all the thresholds included in the graph, meaning that the implementation of the cCVC would be acceptable.

Figure 2. Incremental cost by age

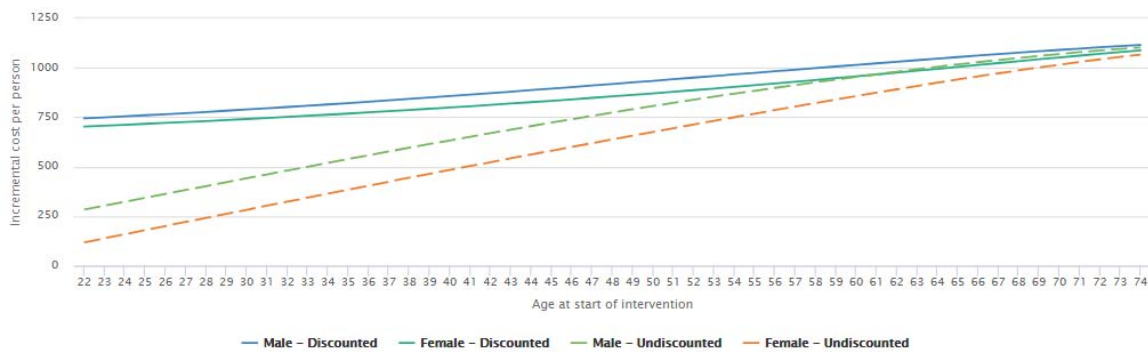
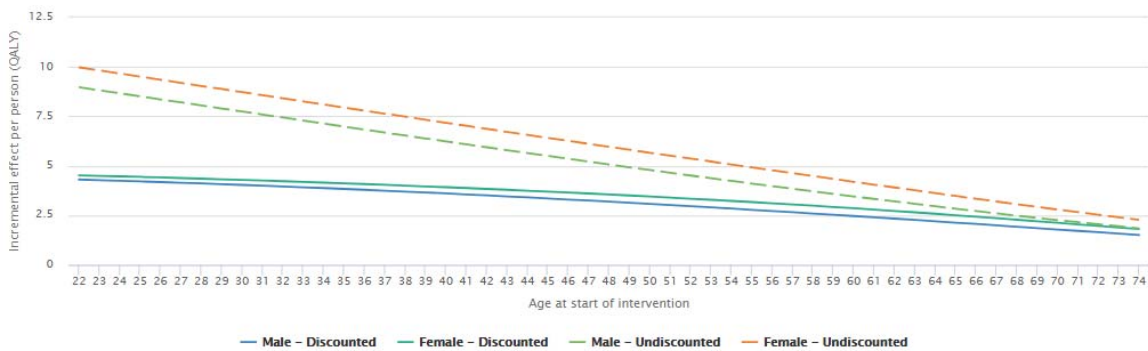


Figure 3. Incremental effects by age

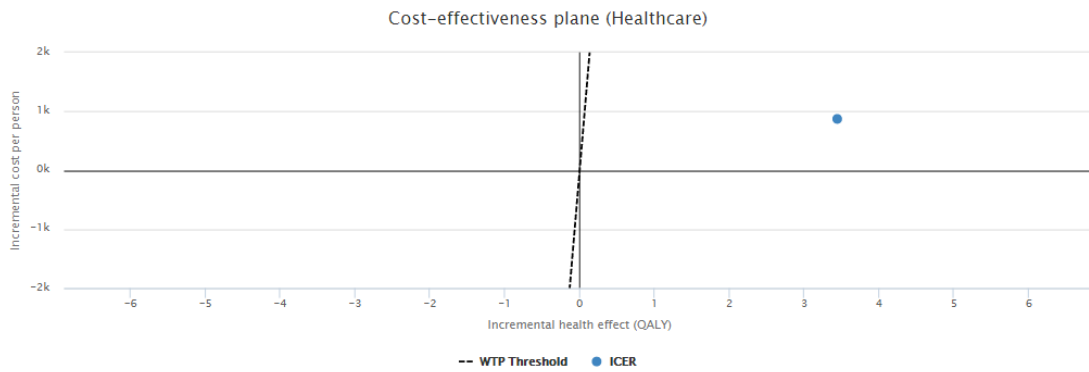


²² <https://www.nice.org.uk/glossary?letter=g>

Figure 4. Cost-effectiveness plane (healthcare costs)

Incremental cost and HRQoL effects

Incremental cost (Healthcare)	870.49
Incremental effects	3.444
Incremental cost-effectiveness ratio (Healthcare)	252.74



WTP Threshold: €15K/QALY €20K/QALY €30K/QALY €50K/QALY €80K/QALY

The following figures show the cumulative costs and effects for a population of 25,105, the estimation of the number of people assigned to BSA who suffer from depression.

Figure 5. Cumulative incremental costs

Population-level impact

Population:

Population-level impact on incremental cost (Healthcare) 21853600.13

Population-level impact on incremental HRQoL 86468.16

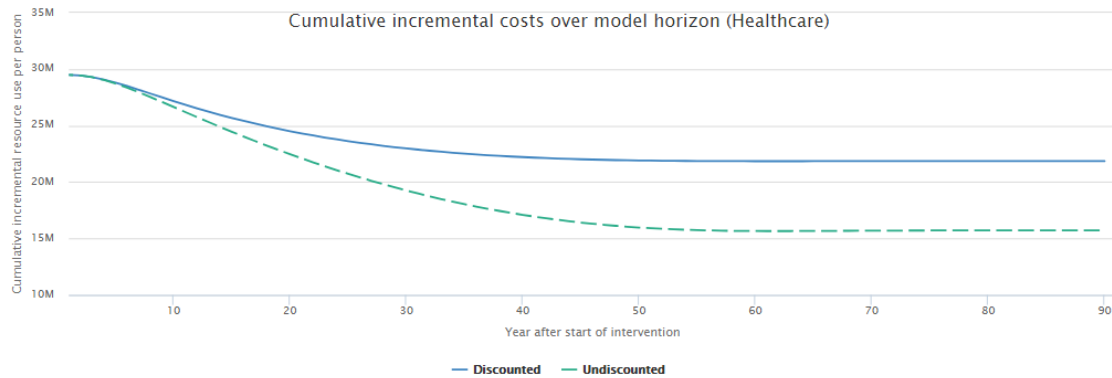
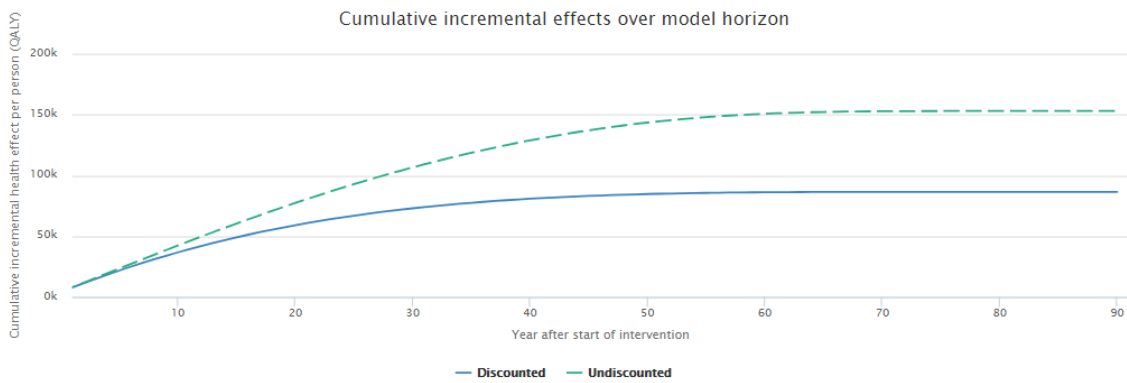


Figure 6. Cumulative incremental effects



Finally, the figures below display the expected transition between states for one specific person (in this case a 22 years old female). Due to the low incidence rates introduced into the model, the patient has a high probability of staying in the baseline state. This probability is slightly larger if she follows the cCVC treatment, since the recovery rate for the intervention group is higher. The probability of dying remains low until the patient is around 80 years old, and it is practically the same in intervention and current care.

Figure 7. Patient flow through model states (Alive states)

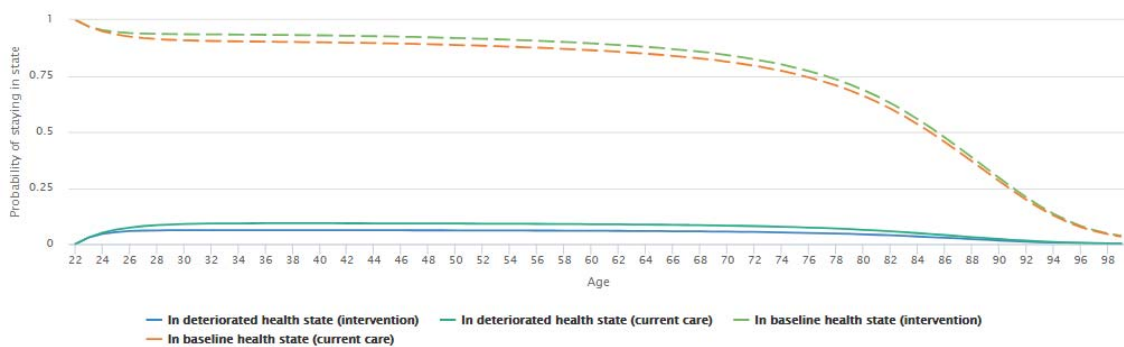
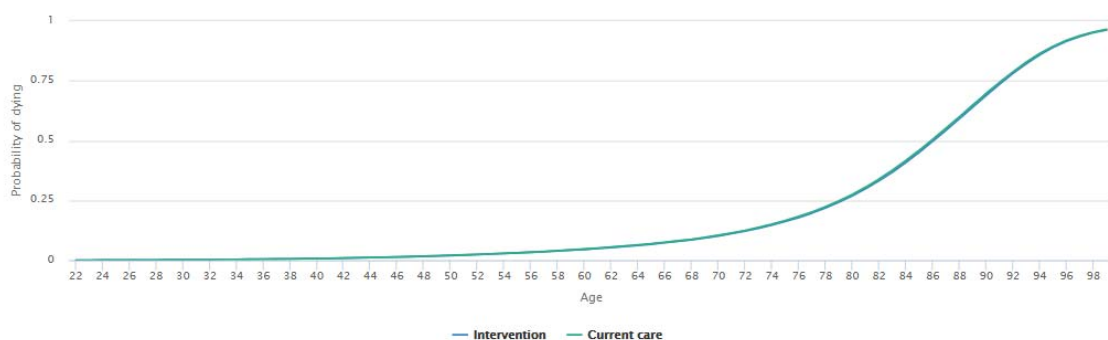


Figure 8. Patient flow through model states (Dead state)



The sensitivity analysis allows us to assess how the output varies when one parameter changes. First, we apply the range of recovery rates for the control group found in the literature (23-42%). We can see in Figure 9 that despite this change, the ICER remains below the WTP threshold. For a willingness to pay of €15K/QALY, the service would be considered cost-effective or not depending on the recovery rate. Likewise, even if the healthcare costs of the intervention

increased moderately (from 1,210 to 2,000€), the solution would still be considered cost-effective. Moreover, if the cost decreased (for example, to 800€), the intervention would be dominant, this is both cheaper and more effective than the current care option (Figure 10).

Figure 9. Univariate sensitivity analysis with a change in the recovery rate for the control group

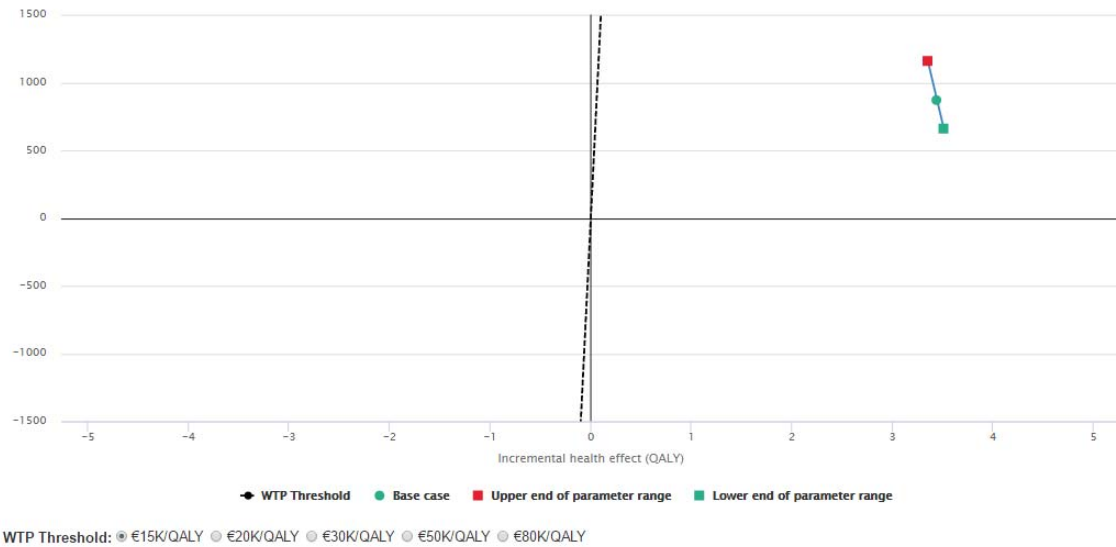
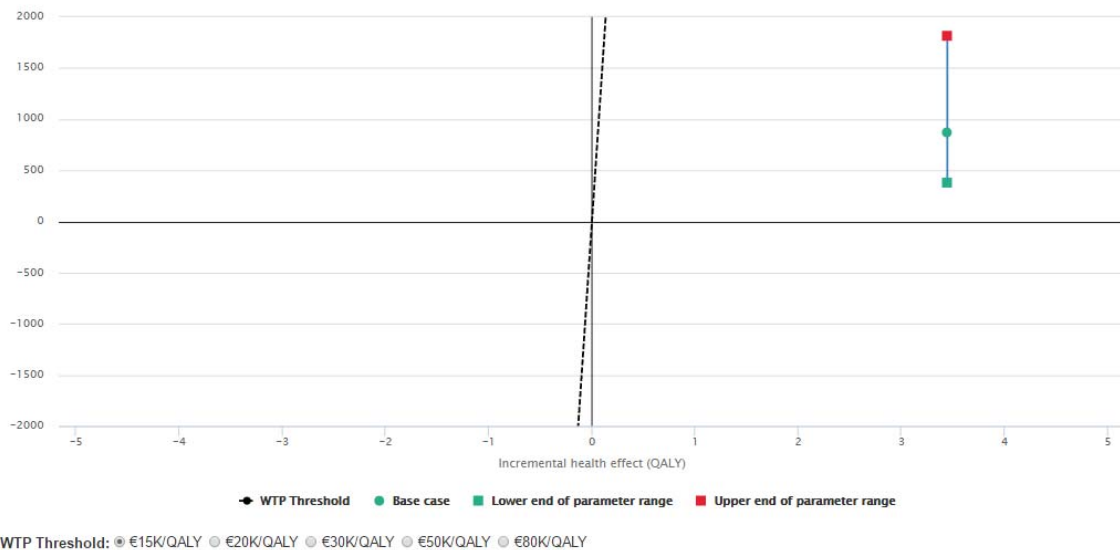


Figure 10. Univariate sensitivity analysis with a change in the healthcare costs for the deteriorated state in the intervention group



The figures below show how a change in several parameters affect the incremental costs (Figure 11) and the incremental effects (Figure 12), when applying a $\pm 10\%$ change in each parameter. We can see that costs are greatly affected by the baseline healthcare costs, and effects by the baseline utility. This is logical because the population spends a larger amount of time in the baseline state.

Figure 11. Parameter impact on incremental costs

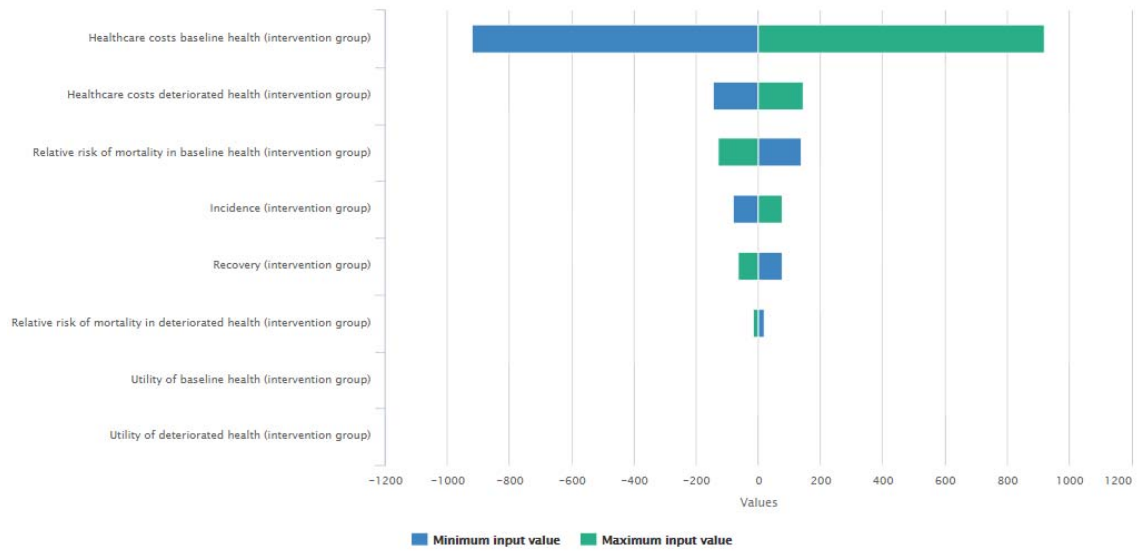
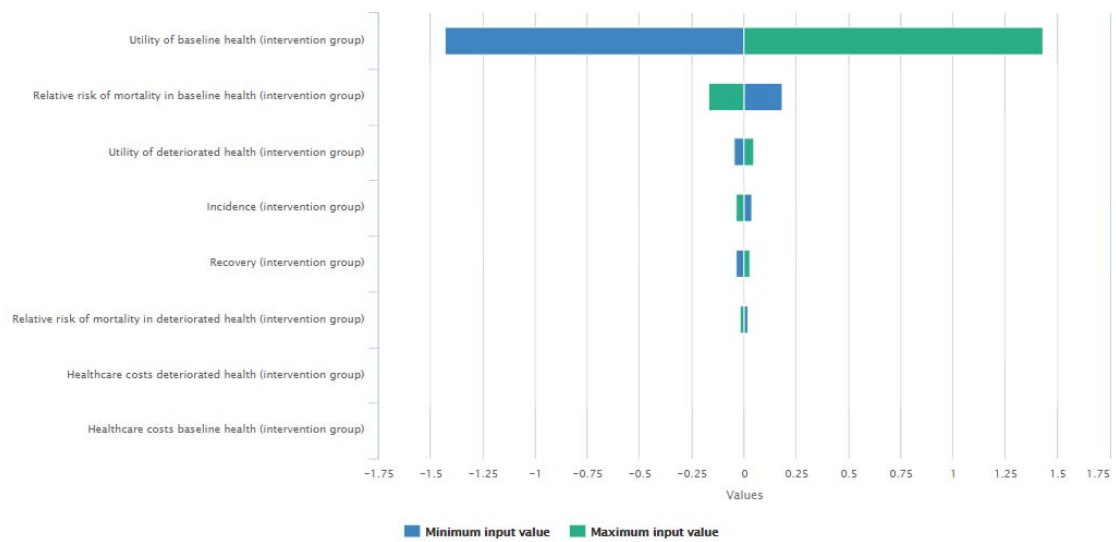


Figure 12. Parameter impact on incremental effects



4. Lessons learned

This section summarises the main difficulties we have encountered in adapting the intervention performed in MasterMind to the Markov model used in MAFEIP. These difficulties are detailed below:

- Some key parameters could not be obtained directly from the results of the MasterMind project, mainly due to the fact that it did not include a control group. Moreover, the project did not compute healthcare costs and did not assess the effects on mortality. This was addressed by searching in the scientific literature comparable studies from which we could extract the required parameters.
- The recurring intervention costs (cost of cCVC sessions) only affect individuals in the deteriorated state, since only those with depressive symptoms need to follow the treatment. However, the section on intervention costs in MAFEIP does not differentiate between states. This was addressed by including the cost of cCVC sessions under healthcare costs (in the deteriorated state).
- Regarding utility, the values for the control group were those that patients had before the treatment started, since that represented the situation in which no intervention had been implemented.

These lessons learned can be applied for the further development of the MAFEIP tool.