

Comparative Expected Value Analysis Study on Programs, Treatments, Medications and Products Reducing the Prevalence of Smoking, Alcoholism, Depression and Obesity in the United States

S. Eric Anderson¹, Morgan Redal², Lorraine Abaro Thomas³, Ginny Sim⁴, Brooke Campbell⁵

^{1,2,3,4,5}La Sierra University, Riverside California

ABSTRACT: It was determined that medication provided the most value reducing the prevalence of smoking, alcoholism, and obesity, while exercise provided the most value treating depression. Value was determined by dividing treatment cost with success rate. Medication provided the most value reducing the prevalence of alcoholism followed by Alcoholics Anonymous, outpatient drug free treatment, , nicotine gum, nicotine patch, Chantix, nasal spray and nicotine inhaler. Acupuncture, lozenges, strips, sticks and laser therapy were not effective smoking cessation treatment options. Medication provided the most value in weight loss followed by liposuction, personal trainer and lap band. Exercise and meditation provided the most value reducing the prevalence of depression followed by medication, support groups and psychotherapy.

KEYWORDS: Alcoholism, Depression, Expected Value Analysis, Obesity, Smoking Cessation

INTRODUCTION

Ninety percent of the \$3.5 billion spent on healthcare expenditures in the United States are for chronic and mental health conditions (Burtoff, 2017). Hafner (2016) reported that 21 million suffer from some type of addiction and only 10% of Americans suffering from addiction get the treatment they need for it. Also, twenty percent of Americans that suffer from depression resort to substance abuse (Addiction Statistics, 2019). Alcohol and drug addiction costs the United States \$600 billion every year. In the past 20 years over 700,000 Americans have died from a drug overdose. The Centers for Disease Control and Prevention (2018) reported that the cost of excessive alcohol use in the United States reached **\$249 billion** in 2010. This study will conduct a comparative expected value analysis to determine the effectiveness of programs, treatments, medications and products reducing the prevalence of smoking, alcoholism, depression and obesity in the United States.

Alcoholism, smoking, obesity and depression not only cause health issues but can be costly over time. The prevalence of this study reports the best treatments of each condition and preventative treatments which were valued based on their success rate. The excessive consumption of alcohol has led to fatality, disease and injury, alcohol related crimes and motor vehicle accidents (Bouchery, E. E., et al., 2011). Premature death due to alcoholism has been estimated on average to be 79,000 deaths annually. The cost alone in the United States back in 2006 for excessive drinking was about \$746 per individual.

Chronic conditions such as ischaemic heart disease and cancers (predominantly lung cancer) have caused health problems in regular smokers (1-4 cigarettes per day). A study comparing regular smokers to non-smokers found increased health risks due to long term smoking (Bjartveit&Tverdal, 2005). This leads to higher healthcare costs for medications and treatments over an individual's lifetime. Obesity alone, on average, can age an individual twenty years. Obesity also causes chronic health conditions (Strum, 2002). These conditions can cause a 36% increase in spending for a hospital. An obese individual may also cause a 77% increase in costs just for medications.

A long term side effect of depression would be its increased mortality rate on those with Diabetes. A study found that major depression was significantly associated with mortality compared to minor depression which was nonsignificant (Lin, et al., 2009). Results suggested that previously diagnosed depression and diabetes patients have a significantly higher risk of mortality after recurrent depression.

These risks to individuals not only negatively impact their health, but lead to costly treatments and medications. Smoking, alcoholism, depression and obesity in the United States threaten the health long term wellbeing of patients. The purpose of this study was to determine the success rates of programs used to treat these conditions to overall benefit the affected individual.

Alcoholism Program Costs and Success Rates

The cost for the 12step Alcoholics Anonymous program can be around a \$250 donation, and the American Society of

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Addiction Medicine (2015) reported that approximately 10% of the people enjoy long term success in their recovery. Outpatient drug-free programs cost \$1,200 and 18% remain sober after five years (Juergens, 2019).

The price for medication to treat alcoholism (naltrexone) varies from \$25 to \$60 per month and the treatment typically lasts for three months for an average cost of around \$150. According to the National Institute of Alcohol Abuse and Alcoholism around 20 – 25% of those receiving medication and therapy remain sober after five years (Thomas, 2018). Detox costs \$2,200 on average and 17% remain sober after five years (Juergens, 2019). Residential treatment costs \$3,100 and 21% remain sober after five years (Juergens, 2019). Inpatient treatment costs \$3,200 on average and 21% remain sober after five years (Juergens, 2019).

The Centers for Disease Control and Prevention (2018) reported that the cost of excessive alcohol use in the United States reached \$249 billion in 2010. Seventy-two percent of the costs resulted from losses in workplace productivity, while the remaining 28% were for health care expenses for

treatment of problems caused by excessive drinking (11%), law enforcement and other criminal justice expenses (10%) and losses from motor vehicle crashes related to excessive alcohol use (5%). Therefore, the total cost of excessive alcohol consumption was \$69.72 billion (\$249 billion * .28) not including workplace productivity. According to the Office of Management and Budget (2019) the excise tax revenue from alcoholic beverages amounted to \$9.9 billion in 2017, which resulted in a net cost of \$59.82 billion. According to the Substance Abuse Mental Health Service Agency (2017), 14.1 million adults ages 18 and older have alcohol use disorder resulting in a \$4,242 (\$59.82 billion / 14.1 million) per capita cost for excessive alcohol use (not including workplace productivity). It was reported that American’s spend on average \$558 per year on alcohol purchases (Bureau of Labor Statistics, 2019). Therefore, the total cost per person (CPP) or savings would be \$4,800 (\$4,242 + \$558). It was found that medication provided the most value treating alcoholism with an annual net benefit (ANB) of \$4,160.

Programs	SR	Cost	Cost/SR	CPP	ANB
Medication	20%	\$128	\$640	\$4,800	\$4,160
Alcoholics Anonymous	10%	\$250	\$2,500	\$4,800	\$2,300
Outpatient Drug Free	18%	\$1200	\$6,666	\$4,800	-\$1,866
Detox	17%	\$2200	\$12,491	\$4,800	-\$7,691
Residential Treatment	21%	\$3100	\$14,761	\$4,800	-\$9,961
Inpatient Treatment	21%	\$3200	\$15,238	\$4,800	-\$10,438

Smoking Cessation Program Costs and Success Rates

The average cost for a stop smoking hypnotherapy session is about \$85 per session or \$340 for a four session stop smoking program (Thompson, 2011). Twenty percent of the participants in the hypnosis group were abstinent at 12 months compared with 14% in the behavioural group (Carmody, 2008). Nicotine gum cost on average about \$4.50 for 10 pieces of gum, the amount most people need to chew daily to control nicotine withdrawal. After three months \$405 (\$4.50 * 90 days), most will be able to begin tapering off the amount of gum they chew (Thompson, 2011). Shiffman (2002) reported that only 8.4% in the OTC nicotine gum group were not smoking at the end of six months. A month’s supply of OTC nicotine patches purchased from an online retailer is about \$80 and roughly \$500 for a six month supply (includes shipping). Shiffman (2002) reported that only 9.2% of those using the OTC patch were not smoking after six months.

A 30-day supply of Chantix from an online retailer costs around \$425 or around \$1,275 for a three-month supply. There is currently no generic version of Chantix. Martin (2019) reported that Chantix had a 22% success rate (SR). A 90-day supply of a generic version of Zyban from an online retailer costs around \$100. According to Martin (2019)

Zyban has a 16% success rate. The average cost of Nicotrol is \$420 for 168 cartridges, which will last for 28 days if one uses six cartridges per day (Ghosal, 2019) and a six-month supply would cost around \$2,500. Nicotine inhalers have an 18% success rate after twelve months (Hialmarson, Nilsson, Sjostrom and Wiklund, 1997). A month’s supply of nicotine nasal spray purchased from an online retailer goes for \$150, and a six-month supply could cost as much as \$900. A nicotine mouth spray typically has a 13.6% success rate after one year (Tonnesen, Lauri, Perfect, Mann and Batra, 2012).

The Federal Drug Agency has ruled that lozenges, strips and sticks that contain small pouches of tobacco for the mouth are not smoking cessation aids. There’s no evidence that these products can help a person quit smoking, but there is evidence that oral tobacco products like snuff and chewing tobacco can cause cancer (Cancer.org, 2019). The average cost of acupuncture as a stop smoking technique ranged from \$50 to \$100. However, this review did not find consistent evidence that acupuncture was an effective smoking cessation technique. A laser therapy program costs \$349. This works like acupuncture, but instead of needles, it uses low-level lasers that won’t hurt the skin. Studies haven’t confirmed that it works (Nazario, 2019).

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Programs	SR	Cost	Cost/SR	CPP	Benefit	AP
Zyban Generic	16%	\$100	\$625	\$3,650	\$3,025	.17
Hypno-therapy	20%	\$340	\$1,700	\$3,650	\$1,950	.47
Nicotine Gum	8.4%	\$405	\$4,821	\$3,650	-\$1,171	1.32
Nicotine Patch	9.2%	\$500	\$5,434	\$3,650	-\$1,784	1.49
Chantix	22%	\$1275	\$5,795	\$3,650	-\$2,145	1.59
Nasal Spray	13.6%	\$900	\$6,923	\$3,650	-\$3,273	1.90
Nicotine Inhaler	28%	\$2500	\$8,928	\$3,650	-\$5,278	2.45
Acupuncture	-	\$75	-	\$3,650	-	-
Strip, stick, Lozenges	-	\$180	-	\$3,650	-	-
Laser Therapy	-	\$349	-	\$3,650	-	-

Health care costs for smokers in the United States are \$2,056 higher than for non-smokers (Dallas, 2019) and 34.3 million Americans 18 and older currently smoke in the United States (CDC, 2019). Because smokers are more likely to die at a younger age than non-smokers, annual pension costs were an average \$296 less for each employee who smoked (Dallas, 2019). According to the Office of Management and Budget (2019) the excise tax revenue from tobacco amounted to \$13.8 billion in 2017 or about \$402 (\$13.8 billion / 34.3 million) per smoker. A pack-a-day habit costs \$188 per month or \$2,292 per year (CDC, 2019). Therefore, the cost per person (CPP) or savings would be \$3,650 { \$2,056 + \$2,292 } - (\$296 + \$402)}. It was found that medication provided the most value reducing the prevalence of smoking with an annual payback (AP) of .17 or about 2 months (365*.17= 62 days).

Weight Loss Program Costs and Success Rates

The American Society of Plastic Surgeons(2019)reported that the average cost for liposuction in 2014 was \$3,518. After liposuction, weight gain was reported in 43% (57% success rate) of the responders, 79.7% would have the procedure again and 86% would recommend the procedure to family or friends (Broughton, Horton, Lipschitz, Kenkel, Brown and Rohrich, 2006).

Two weekly personal training sessions would cost \$400 per month or \$4,800 annually. Those that work with a trainer can expect on average to lose one to two pounds a week and

see noticeable results within the first three to six weeks (Arroyo, 2017). McClaran (2003) found that a personal trainer significantly increased clients’ physical activity and 60% of study participants were successful.

The average cost of Lap-Band surgery is about \$3,500 with insurance and \$15,000 without insurance (Quinlan, 2019). After 16 years, 62% of the 3,227 individuals treated with a laparoscopic adjustable gastric band still had significant weight loss (O’Brien, MacDonald, Anderson, Brennan & Brown, 2013).

All prescription weight-loss drugs approved for long-term use produce significant weight loss compared to the placebo (Mayo Clinic, 2018). Studies show that the addition of weight-loss medication to lifestyle changes results in greater weight loss than lifestyle changes alone produce. Over the course of 12 months, one can expect a mean weight loss of 3 to 7% of total body weight beyond that achieved with lifestyle changes alone (Mayo Clinic, 2018). Phentermine (Adipex-P) is a popular drug used to decrease appetite that is available in a generic version (Mayo Clinic, 2018).

On-line retailers selling the Adipex-P quote an average retail price of \$34.33 with an annual cost of \$411.96. After stopping weight-loss medication people often gain back some of the weight they lost. However, adopting healthy lifestyle habits may help limit weight gain. The ten-year cost would be \$4,119.60. Phentermine based on 524 user ratings, was found to be 87% effective (Drugs.com, 2019).

Programs	SR	Cost	Cost/SR	CPP	Benefit	AP
Weight Loss Drugs	87%	\$4110	\$4,724	\$1,429	-\$3,295	3.30
Liposuction	57%	\$3518	\$6,172	\$1,429	-\$4,743	4.31
Personal Trainer	60%	\$4800	\$8,000	\$1,429	-\$6,571	5.59
Lap Band	62%	\$15000	\$24,193	\$1,429	-\$22764	22.76

The National Center for Health Statistics estimated in 2015-2016 in the U.S., 39.8% of adults aged 20 and over were obese (including 7.6% with severe obesity) and that another 31.8% were overweight (Fryar, 2018). Approximately \$147 billion is added medical expenses per year due to obesity in

the United States. Therefore, the cost per person (CPP) for one that is obese or the savings in medical expenses would be \$1,429 per year (Antonelli, Maalouf, Pearle & Lotan, 2014). It was found that medication provided the most value

reducing the prevalence of obesity with an annual payback (AP) of 3.3 years.

Depression Treatment Program Costs and Success Rates

Antidepressants improved symptoms in about 20 out of 100 (NCBI, 2015) and a generic antidepressant can be purchased for as little as \$4 per month or \$48 per year (Westra, 2010). Research shows that psychotherapy for depression is as effective as antidepressant medications during the treatment period (Westra, 2010). However, seeing a psychotherapist costs around \$100 per session, so a six session treatment program spread over three months would cost around \$600, which is about 12 times the annual cost for generic antidepressant medication. Pfeiffer, Heisler, Piette, Rogers and Valenstein (2010) reported no significant difference in depression outcomes between those

randomized in a peer support intervention versus cognitive therapy.

The cost to join a weekly support group can cost as little as \$15 per week (\$60 per month) or \$180 (three months). Goyal (2014) reported that mindfulness meditation may be just as effective as medication when it comes to the treatment of depression, and no third-party cost is associated with engaging in mindfulness. Likewise, exercise enhances the action of endorphins circulating throughout the body improving natural immunity and is as effective at reducing mild depression as antidepressant medications (Harvard Health Letter, 2013).

Programs	SR	Cost	Cost/SR	CPP	Benefit	AP
Exercise	20%	\$0	\$0	\$4,382	\$4,382	.00
Meditation	20%	\$0	\$0	\$4,382	\$4,382	.00
Medication	20%	\$48	\$240	\$4,382	\$4,142	.05
Support Groups	20%	\$180	\$900	\$4,382	\$3,482	.20
Psycho-therapy	20%	\$600	\$3,000	\$4,382	\$1,382	.68

The amount spent to treat depressive disorders in the United States is \$71 billion (Dieleman, Baral & Birger, 2016), and 16.2 million adults in the United States have at least one major depressive episode in a given year (Koskie, 2018). Therefore, the cost per person (CPP) for depressive disorders in the United States is \$4,382 per person (\$71 billion / 16.2 million). It was found that exercise and meditation provided the most value treating mild depression followed by medication, which had an annual payback (AP) of .05.

CONCLUSIONS

The causes of obesity, addiction, and depression are complex and beyond the scope of this paper. Accordingly, the purpose of this study was not meant to delve into the complexities of these health issues but to provide a broad and comparative overview of the average and typical costs associated with their treatment, understanding full well that treatments differ greatly in price depending on the type and severity of the obesity, addiction, and depression. Thus, more in-depth research should be conducted on the costs associated with each of these specific health issues.

Based on this study’s findings, for the most part getting treatment does provide value. Medication provided the most value treating alcoholism with an annual payback (AP) of .16 or about two months (365*.16= 58.4 days). Medication also provided the most value reducing the prevalence of smoking with an annual payback (AP) of .17 or about two months (365*.17= 62 days). Exercise and meditation provided the most value treating depression followed by

medication, which had an annual payback (AP) of .05. Medication provided the most value reducing the prevalence of obesity with an annual payback (AP) of 3.3 years.

Harris (2016) reported that 119 million people in the United States use prescription drugs. However, many Americans are opposed to the use of medication so they rely more heavily on natural remedies to treat disease and addiction. Fortunately for them, many treatments don’t require medication and in some cases provide more value. For example, exercise and meditation were found to have provided more value than medication when it came to treating mild depression.

Not every type of addiction or disease is preventable, but since these health concerns cost the United States billions each year, more should be invested into treatments and education programs that provide value to help newer generations veer away from unhealthy lifestyles. Effective programs could potentially decrease the costs that are being spent each year on treatments and healing remedies because of addiction.

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