Cardiovascular diseases are the main cause of death in Argentina. This article analyzes economic evaluations on cardiovascular prevention for this country. A literature search was conducted in five electronic databases during December 2009. Inclusion criteria were complete economic evaluations addressing at least one cardiovascular health outcome for the Argentinean population. Finally, nine studies were included evaluating 14 comparisons. Interventions oriented to primary or secondary prevention in patients that had undergone coronary angioplasty, with a previous cardiovascular event or equivalents, with a hospitalization for heart failure or general population were evaluated. Bread salt reduction, antihypertensive treatment, mass educational campaigns and polypill strategies could be considered cost effective. The available economic evidence to guide resource allocation in cardiovascular disease in Argentina seems to be scarce and limited.

**Keywords:** Argentina • cardiovascular disease • cost–effectiveness • economic evaluations • Latin America middle-income countries • prevention

**Background**

Cardiovascular diseases (CVDs) represent the leading cause of premature death throughout the world. In 2004, CVDs (mainly coronary heart disease and cerebrovascular disease) were estimated to cause almost 32% of all deaths in women and 27% in men [1]. In the last few decades, the proportion of cardiovascular deaths occurring in low- and middle-income countries has risen greatly, now surpassing 80% of the global cardiovascular deaths and 85% of global cardiovascular burden of disease [2,3]. In fact, coronary heart disease and cerebrovascular disease are currently the first and second cause of death, respectively, in middle-income countries, and are expected to represent 10.4% of the burden of disease in those countries by 2030 [1]. Argentina is an upper middle-income country located at the southern cone of South America. In 2006, according to death certificates, CVD (mainly coronary heart disease, stroke and heart failure) caused 34.2% of all deaths and 12.6% of total years of potential life lost [4]. Only coronary heart disease and cerebrovascular disease in Argentina produce more than 600,000 disability-adjusted life years (DALYs) lost each year [5]. This poor situation is alarming considering that more than 71% of these DALYs are attributable to modifiable risk factors such as high blood pressure, high blood cholesterol, high glycemia, low physical activity, tobacco use, overweight, and low fruit and vegetable consumption [5].

At least 80% of all CVD worldwide is potentially preventable [2]. As a result of the urbanization process and the lack of timely interventions, the proportion of chronic (and cardiovascular) diseases potentially preventable is higher in low- and middle-income countries than in high-income countries, especially among adults younger than 70 years [6]. According to the main population target, cardiovascular preventive interventions can be classified into two different groups: primary prevention (in people who have not yet developed overly clinical CVD) and secondary prevention (in people with established CVD, such as coronary heart disease, cerebrovascular or peripheral vascular disease) [7]. There is strong evidence that supports the effectiveness of several strategies based on risk factors controlling interventions to prevent CVD [8,9]. Aspirin, β-blockers and other antihypertensive drugs, lipid-lowering drugs, coronary revascularization and carotid endarterectomy are some examples of individual interventions that have been shown to be effective on secondary prevention [7–9]. In addition,
the WHO has strengthened its efforts to promote population-wide primary prevention through the Framework Convention on Tobacco Control and the Global Strategy for Diet, Physical Activity and Health [10]. Unfortunately, strategies to manage cardiovascular conditions that have been developed for high-income countries are not feasible or affordable to most low- and middle-income countries. More than half of the published studies aimed to address the cost–effectiveness of interventions on cardiovascular primary prevention until 2006 were based on the healthcare systems context of the UK or the USA [11]. Nevertheless, there are some interventions expected to be feasible, effective (or even cost effective) and affordable in low- and middle-income countries. For instance, implementation of just four population-level measures of the Framework Convention on Tobacco Control and reducing population levels of salt consumption by 15% is expected to prevent approximately 13.8 million deaths over 10 years in 23 selected low- and middle-income countries [12]. Indeed, these interventions, as well as multidrug strategies to treat individual patients with high-risk cardiovascular disease, seem to be cost-effective in low- and middle-income settings [13]. However, cost–effectiveness for specific interventions could differ substantially across this group of countries [13], and application of cost–effectiveness results in settings different from the ones in which the information was generated could be misleading [14].

Urgent action is needed in order to reduce the impact of CVD and related risk factors in low- and middle-income countries. On the other hand, new and expensive technologies and drugs arise every year. This represents a huge challenge for settings with scarce resources and where scale-up of interventions from developed countries could be difficult. In this context, the role of health economic evaluations is expected to be of paramount importance in order to facilitate the health decision-making process and to support local health policies. Unfortunately, knowledge regarding economic evaluations use is scarce and policy decision makers tend to be suspicious about their results, specifically in developing countries. In most developing countries, such as Argentina, the quantity, availability and utilization of this type of analysis remain unknown.

The aim of this article is to identify, analyze and compare the complete economic evaluations on cardiovascular preventive interventions (including both primary and secondary prevention) in Argentina. Results should also provide information regarding the development of this kind of analysis in Argentina, the quantity and characteristics of economic evaluations available to local health decision makers, and indicate areas in which evidence is particularly scarce or even absent. These results could also be useful for other developing countries, especially in Latin America, in order to anticipate future challenges to combat the CVD epidemic.

Methods
A literature search was conducted in order to identify complete health economic evaluations addressing interventions on primary or secondary prevention of CVD on the Argentinean population. Five electronic databases were searched up to December 2009: PubMed, EMBASE, Latin American and Caribbean Literature on Health Sciences database (LILACS), National Health System, Economic Evaluations Database (NHS EED) and Health Technology Assessment (HTA) of the Centre for Reviews and Dissemination of York University. Search strategies for general databases (PubMed, EMBASE and LILACS) were developed ad hoc combining different terms for the type of analysis, country (including place of publication and author address fields) and conditions (including both cardiovascular risk factors and established CVDs). Supplementary Box 1 shows the search strategies used for PubMed, LILACS and EMBASE [10]. In specific economic databases (NHS EED and HTA) only the country (Argentina) was included as a search term. No restrictions on language or date of publication were used. In addition, local experts were consulted about additional studies not found in electronic databases.

Title and abstract (when available) of all retrieved references were screened by one researcher and the full text of all potentially relevant references was obtained for inclusion/exclusion assessment. References from the full text articles retrieved were reviewed for potentially relevant studies. Studies were included when they fulfilled all of the following predefined inclusion criteria:

- Reports that compare both costs and consequences of two or more interventions (that is, complete economic evaluations [15]);
- Addressing at least one cardiovascular health outcome (such as myocardial infarction, stroke, revascularization, heart failure, cardiovascular death or hospitalization);
- Including, but not necessarily limited to, Argentinean population.

Studies that only report costs of disease or costs of health care programs (partial economic evaluations) were excluded. No restriction on gender, age or economic status of the population addressed by the economic evaluations was considered for inclusion/exclusion. Included studies were described and compared using a predefined list of characteristics such as year, type and perspective of analysis, target population, comparators, health outcomes addressed, time horizon, discount rate, type of sensitivity analysis, threshold of cost–effectiveness selected, results, and author’s interpretation and funding.

Results
After the initial search and excluding duplicates, 108 references were retrieved and full texts of 13 potentially relevant studies were obtained. Reasons for considering the 95 remaining references as not potentially relevant were: primary studies in animals or basic research, no cardiovascular health outcome addressed, review articles or other noneconomic studies, studies on healthcare cost of diabetic people (four references). Four studies were considered as potentially relevant after the first screening based on title or abstract (when available) but were finally excluded. One study was excluded because even when authors estimated the expected effectiveness (including cardiovascular events avoided) of several population-based interventions for tobacco control (price interventions on taxes, clean indoor air laws, mass media policies, advertising bans/warning labels and strategies to reduce youth access
Economic evaluations on cardiovascular preventive interventions in Argentina

Review

Three economic evaluations compared two different strategies for Chagas disease prevention, were excluded because they failed to address cardiovascular outcomes such as heart failure, a long-term consequence of Chagas disease. Finally, a review of international cost–effectiveness analysis of interventions on coronary heart disease was also excluded. None of the economic evaluations described in that review was on Argentinean populations. After the exclusions, nine complete health economic evaluations addressed interventions targeted to secondary prevention settings. Three economic evaluations compared two different strategies for people undergoing a percutaneous transluminal coronary angioplasty (PTCA). Grines et al. compared in a multicenter randomized controlled trial the hospital costs and effectiveness of two different management strategies (accelerated vs traditional care) for low-risk patients with a successful primary PTCA of a native coronary artery after an acute myocardial infarction. From a hospital perspective, accelerated care reduced hospital costs with a similar effectiveness at 6 months. However, the study was designed to detect a 10% (or higher) difference in event rates, and costs of follow-up were not considered. Another study compared drug-coated stents against conventional stents with or without oral rapamycin (sirolimus). Ferrante compared conventional stents versus drug-eluting stents using a decision tree model. Effectiveness data were obtained from a meta-analysis of five international clinical trials comparing drug-eluting (rapamycin or plactitaxel) versus conventional stents. No differences in mortality, but a lower rate of restenosis for drug-eluting stents was assumed. Total annual hospital costs by patient (initial procedure plus additional costs of restenosis) were lower in conventional stents strategy (cost-minimization analysis). The incremental cost by restenosis avoided with drug-eluting strategy was $49,598 (2003 Argentine pesos).

According to the author’s conclusion, drug-eluting stents looked not cost-effective (even when a cost–effectiveness threshold was not specified) but results were highly sensitive to the coated stent cost. Rodriguez et al. compared conventional stents plus oral rapamycin versus drug-eluting stents for patients undergoing a PTCA in a randomized controlled trial involving three centers in Argentina. After a mean follow-up of 18 months, both strategies were similar on clinical outcomes as revascularization, deaths and clinical events, but mean cost was lower in the conventional stents plus oral rapamycin arm (cost-minimization analysis). However, the trial had noninferiority design and small differences on clinical outcomes were probably not detected owing to lack of statistical power.

Three studies evaluated different pharmacologic strategies aimed at cardiovascular prevention in people with established CVD or equivalent high-risk groups. Botto et al. addressed the cost–effectiveness of the long-term use of ramipril plus usual care (aspirin, antihypertensives, cholesterol-lowering drugs, diuretics) versus usual care for high cardiovascular risk patients defined as people older than 55 years with coronary heart disease, stroke, peripheral vascular disease or diabetes plus an additional cardiovascular risk factor. For the analysis, ramipril efficacy for cardiovascular prevention was obtained from the Heart Outcomes Prevention Evaluation (HOPE) study. Efficacy after the follow-up period of the HOPE study was modeled assuming that

Cost–effectiveness of interventions for secondary prevention

The majority of the included studies (seven out of nine) addressed interventions targeted to secondary prevention settings. Three economic evaluations compared two different strategies for people undergoing a percutaneous transluminal coronary angioplasty (PTCA). Grines et al. compared in a multicenter randomized controlled trial the hospital costs and effectiveness of two different management strategies (accelerated vs traditional care) for low-risk patients with a successful primary PTCA of a native coronary artery after an acute myocardial infarction. From a hospital perspective, accelerated care reduced hospital costs with a similar effectiveness at 6 months. However, the study was designed to detect a 10% (or higher) difference in event rates, and costs of follow-up were not considered. Another study compared drug-coated stents against conventional stents with or without oral rapamycin (sirolimus). Ferrante compared conventional stents versus drug-eluting stents using a decision tree model. Effectiveness data were obtained from a meta-analysis of five international clinical trials comparing drug-eluting (rapamycin or plactitaxel) versus conventional stents. No differences in mortality, but a lower rate of restenosis for drug-eluting stents was assumed. Total annual hospital costs by patient (initial procedure plus additional costs of restenosis) were lower in conventional stents strategy (cost-minimization analysis). The incremental cost by restenosis avoided with drug-eluting strategy was $49,598 (2003 Argentine pesos).
ramipril benefit remains constant. Costs of inputs were derived by micro-costing from multiple local sources. According to these assumptions, use of ramipril was found to be cost-saving, avoiding $56 (2001 Argentinean pesos) per life year gained. Lim et al. compared costs and consequences of scaling-up a multidrug regimen (a statin, aspirin and two blood-pressure-lowering medicines) for secondary cardiovascular prevention (people with established CVD or an absolute risk of dying from a cardiovascular event of 15% or more over the next 10 years) in 23 selected low- and middle-income countries [25]. Coverage level of the multidrug regimen was assumed to scale-up from basal levels estimated for each country at the beginning of the study to 50 or 80% of those accessing health systems (according to the country) at the end of the 10-year period addressed. Health benefits were estimated comparing against mortality projections assuming that basal coverage level remained constant. Efficacy of the multidrug regimen for cardiovascular prevention was derived by multiplying the relative risk for each individual drug reported on previously published studies. However, the methodology for study selection was not described. Costs associated to the scaling-up, including medication, laboratory test and service delivery were derived from the WHO – Choosing Interventions that are Cost Effective (WHO-CHOICE) project [102]. Costs saved by further reduction in healthcare use were not estimated. According to the study, the cost of the scaling-up program in Argentina was the highest between the analyzed countries. However, estimates of health benefits in Argentina were not available. Rubinstein et al. performed a similar analysis addressing the cost–effectiveness of a multidrug regimen (or modified polypill strategy, including a diuretic, aspirin and two other blood-pressure-lowering medicines) for the uninsured population of Buenos Aires city with an estimated combined risk of a cardiovascular event (coronary heart or cerebrovascular disease) over the next decade above three different thresholds: 5, 10 and 20% [28]. In particular, the last group of people could be considered more similar to the population addressed by Lim et al. and similar to an expected population in secondary prevention settings. In this subpopulation, the modified polypill regimen was found to be cost-effective. This study is discussed in more detail in the next section (primary prevention).

An additional study on secondary prevention estimated the total costs and consequences of nesiritide versus usual care in patients with a first hospitalization of acute heart failure in intensive care units that require the use of vasoactive drugs [23]. After a literature review of published studies assessing nesiritide efficacy (seven trials, one observational study and two meta-analyses), authors assumed no-differences on 1-year mortality rate for both strategies. Efficacy of nesiritide to reduce length of stay at the first hospitalization (in days) and to prevent a further hospitalization in the first year was derived by the authors by meta-analyzing results from published studies. The economic impact of nesiritide was different according to the type of payer perspective (public health system, private insurance or social security). Assuming no-differences on mortality (cost-minimization analysis), nesiritide comparator was found to be less expensive for private insurance, but more expensive for the public-health system. Social security had different results according to the type of organization (less expensive for wealthier, but more expensive for poorer social health insurances). A cost–effectiveness analysis (that is incremental cost per hospitalization avoided) was not performed by the authors.

**Cost–effectiveness of interventions for primary prevention**

Three studies [24,26,28] addressed interventions aimed mainly at primary prevention. Asaria et al. addressed the cost and consequences of a community-based intervention combining salt intake reduction plus four tobacco control interventions in 23 selected low- and middle-income countries, including Argentina [24]. Efficacy of interventions for cardiovascular prevention was derived from expected changes on population mean systolic blood pressure (from Intersalt study [30]) and smoking prevalence (from several sources). Health benefits were estimated comparing against mortality projections assuming no change on exposure level. Costs associated with planning, implementation and monitoring interventions were derived by microcosting and using the WHO-CHOICE databases of costs [102]. Costs saved by further reduction in healthcare use were not estimated. Accumulated costs and consequences were reported separately, and a cost–effectiveness analysis (that is incremental cost per death avoided) was not performed by the authors. Rubinstein et al. analyzed six different interventions for cardiovascular prevention in the uninsured population of Buenos Aires [28]. Interventions analyzed included both individual-based (pharmacologic treatment for high blood pressure and high blood cholesterol, bupropion for tobacco cessation and modified polypill strategy) and community-based interventions (reduction of salt in bread and mass media intervention to promote healthy habits). Interventions were compared against a hypothetical counterfactual scenario of no interventions being in place (no costs). Costs considered include program-level expenses (i.e., administration, training and information dissemination by multiple media sources) and patient-level costs (i.e., primary-care visits, ancillary tests and drugs). Potential cost-savings related to clinical events prevented by interventions were not addressed. Efficacy of interventions for cardiovascular prevention was derived from several published studies. According to the authors, population based interventions were found to be more cost effective than individual-based interventions. Regarding the cost–effectiveness threshold defined by the authors, reduction of salt in bread and health education through mass-media campaigns (and the modified polypill strategy targeting people with a 20% or greater absolute risk) were cost effective. Finally, Pichon Riviere et al. developed a simulation model to estimate the utility gained (measured as quality-adjusted life years) and the costs saved by tobacco-cessation strategies for the general population in seven Latin-American countries, including Argentina [26]. Even though the model is able to analyze and compare different types of interventions aimed at increasing the probability of a quit attempt, increasing the success rate of a quit attempt, or avoiding relapses, to date only results of a comparison of two hypothetical interventions have been reported.
**General characteristic of included economic evaluations**

Three economic evaluations were carried out in the context of a more extensive analysis, including several low- and middle-income countries [20,24,25]. The rest of the studies were conducted by local research teams, addressing costs and consequences of interventions exclusively on the Argentinean population. The source of funding was reported only in four studies [20,23,26,28], and only two were not funded by the industry [26,28]. One additional study was not sponsored by industry, although source of funding was actually not specified [27].

Relating to technical characteristics, three included studies were based on decision tree models [21–23]; two studies were based on clinical trials (piggy-back analysis) [20,27]; two studies utilized general analytical models developed by authors [24,25]; one study used a general model developed by the WHO [28] and another study was based on a first-order Monte Carlo simulation model [26]. A sensitivity analysis was conducted in all studies except those alongside clinical trials. A one-way sensitivity analysis was conducted in five economic evaluations [21–24,28] while a probabilistic sensitivity analysis was conducted in two studies [25,26].

With regard to the analysis, all included studies considered only a payer perspective. Five studies considered a time horizon longer than 2 years [21–24,26,28], and three of them applied an annual discount rate between 3 and 5%, equal for both costs and benefits [21,26,28]. Five studies did not address all potentially relevant costs. A first group did not include ambulatory costs associated with medication, visits and/or follow-up after a PTCA [20,22]. Probably the net effect of excluding these costs in these particular studies is small, considering that both had a short time horizon (6 months and 1 year) in which the initial hospitalization (including PTCA) is expected to represent the highest proportion of overall costs. In the second group, costs associated with clinical events avoided (i.e., hospitalizations by myocardial infarction or stroke) were not addressed [24,25,28]. In these studies, a clear bias harming the interventions’ performance could be expected. On the other hand, one economic evaluation did not address all potentially relevant health outcomes for some interventions [28]. For instance, in the case of mass media intervention to promote healthy habits or bupropion for tobacco cessation, this study did not consider the potential effect of interventions on other chronic diseases such as diabetes, cancer or chronic obstructive pulmonary disease. Again, this bias is expected to undermine the interventions performance, underestimating their real cost–effectiveness.

Only two studies included utilities as a health-benefit measure [26,28]. One study utilized year life gained as the main health outcome [21]. The remaining studies considered number of deaths, clinical events, procedures and/or days of hospitalization avoided as the main health outcomes. Four studies performed a cost-effectiveness [21,22] or cost-utility analysis [26,28], but only one study specified the cost-effectiveness threshold used to define an intervention as cost effective [28].

Four studies performed a cost-minimization analysis assuming no-differences on benefits between comparators [20,22,23,27], therefore only economic results were reported as outcome. Finally, three studies performed a cost and consequence analysis, and both total costs and health benefits were reported separately [23–25].

**Discussion**

Only nine complete economic evaluations addressing interventions aimed to prevent CVDs in Argentina were found. More research was expected to be done in this area taking into account that CVDs are the main cause of morbidity and mortality in the country [4]. Even though a quality assessment tool for economic evaluations was not utilized in this review, some important technical aspects from retrieved studies need to be highlighted. In general, all the included studies lacked a precise description of methods. The source of funding was not properly reported in five of nine studies. Time horizon of analysis was in general short (less than 2 years) and societal perspective was not considered, not even in a secondary analysis. In addition, few studies included patients’ preferences or utilities as the main health-benefit outcome measure. Finally, piggy-back studies probably had insufficient statistic power to detect small (but clinically relevant) differences on health outcomes to justify a cost-minimization analysis.

Regarding results, most of the evaluated studies were focused on interventions targeted at secondary (applicable to high-risk population) rather than primary prevention. For secondary prevention, pharmacologic regimens (and especially multidrug regimens) were shown to be cost effective or affordable in three studies [21,25,28]. On the other hand, coated stents for PTCA were found to be more expensive and with small clinical benefit compared with conventional stents [22]. According to authors, coated stents appear to not be cost-effective for local settings but this could change as cost difference becomes lower. Even when Grines et al. included Argentinean participants recruited from local centers in order to compare accelerated versus traditional care after PTCA, the authors did not report a specific analysis of this subset (probably small) [20]. In this context, policy makers should be cautious since there are known issues that make the application of cost-effectiveness results in other settings different from the ones in which the information was generated [14]. Only three studies evaluated interventions aimed to primary cardiovascular prevention [24,26,28]. Since Asaria et al. as well as Lim et al. reported costs and consequences of interventions separately, and they failed to estimate the costs saved by further reduction in healthcare use, the final cost-effectiveness of addressed interventions remains unknown. Nevertheless, the authors considered that these interventions could reduce CVD at an affordable cost for the 23 selected countries [24,25]. According to Rubinstein et al., community-based interventions were shown to be more cost-effective than clinical interventions [28]. However, their results, although still cost-effective for Argentina in terms of cost per DALY averted, were much higher than those obtained for the America B subregion (low child and low adult mortality) by Murray et al. in a previous study [31]. This could reflect not only the great heterogeneity among Latin American countries pertaining to this region, but also that data used for the calculations in the last study were based on gross average estimates, not mentioning that Argentina and, in particular Buenos Aires, is one of the leading healthcare spenders in the region. Moreover, in an economic evaluation
available after literature search was completed, reduction of salt in bread and modified polypill strategy for people with more than 20% of cardiovascular risk for the next 10 years were cost-saving, taking into account the entire Argentine population [32]. This new analysis has some methodological differences as compared with the previous study published by Rubinstein et al. using the WHO-CHOICE methodology as for example, costs reduction associated with cardiovascular acute events avoided were calculated. Note also that in Rubinstein et al., the potential effect of interventions on other chronic diseases was not considered either [28]. This could underestimate the real incremental cost-effectiveness ratio of interventions, such as bupropion for tobacco cessation or mass media intervention, to promote healthy habits, where reducing lung cancer incidence, diabetes and chronic obstructive pulmonary disease is also expected. In fact, myocardial infarctions and strokes represent less than 12% of annual cost of tobacco-attributable diseases in Argentina [33]. In this sense, even when Pichon Riviere et al. included other conditions besides CVDs in their economic model, the study only provides results comparing hypothetical interventions [26]. Future publications of this model are expected to provide an estimation of cost-effectiveness of some tobacco-cessation interventions, not just for Argentina but also for other Latin American countries. Cost-effectiveness of coronary surgery versus PTCA for revascularization (when both indicated), new highly sensitive diagnostic tests for ischemic heart disease and preventive interventions for Chagas myocardiopathy are some examples of issues that look to have not been addressed yet in Argentina.

Some important limitations of this study need to be mentioned:

• Search strategies in electronic databases were not improved looking for lack of recall and lack of precision;

• The literature review was not exhaustive, and gray literature was not especially addressed (for instance, by hand searching nonindexed journals or local congress proceedings);

• Retrieved references were assessed by only one reviewer;

• Even when inclusion criteria were defined prior to the search, a formal inclusion/exclusion form was not used.

On the other hand, even considering these minor flaws and drawbacks, this non-narrative review should properly reflect the economic evidence that is easily available to local health decision makers.

According to the number of studies retrieved, health economic evaluations on CVD seem to be still poorly developed and underused in Argentina (and probably their quality needs also to be improved). However, other approaches should be explored in order to know whether these tools could have an impact on resource-allocation decisions, such as a bibliometric analysis of government policy documents, or even local clinical guidelines [34]. On the other hand, since the publication rate in indexed journals for Argentinean researchers is low, it is possible that other economic evaluations on cardiovascular prevention had been carried out but eventually not published in peer-review indexed journals. A more exhaustive literature review could be needed to find out additional evidence in this particular area. Nevertheless, the resource allocation decision process on cardiovascular prevention in Argentina seems to be empirical rather than based on scientific evidence. This is especially dismaying taking into account that CVDs are the leading cause of death and most of the cardiovascular burden of disease is potentially preventable. Considering its growing burden and costs in Argentina, this review aims to enhance the policy debate focused on the use of economic evidence to make policy decisions highlighting the importance as well as the scarcity of economic evaluations regarding these conditions.

Expert commentary

Several factors could contribute to the reduced number of economic evaluations retrieved in this review. Some of them are exclusive for chronic diseases and others are more general. First, despite the increasing burden of CVD in Argentina, ranking first over the last decades as a cause of mortality and morbidity, national health programs and policies are still focused on interventions aimed to tackle communicable diseases, perinatal or childhood conditions. Second, lack of knowledge regarding relevance and usefulness of economic evaluations among health decision makers is certainly linked to an underuse of these decision tools in general, not just in CVDs. In this sense, a local qualitative study on Argentinean health decision makers has shown that even though economic considerations to prioritize resource allocation were increasingly being accepted, and despite the fact that this phenomenon was boosted after the 2001 financial crisis, the use and application of economic evaluations as a specific tool was very poor and restricted to a limited handful of experiences [35]. Third, Argentina has a pluralistic and fragmented healthcare system, consisting of a multi-tier system divided into three large sectors: public, social security and private [36]. In this context, differences on incentives and objectives between different sectors (or even subsectors) could result in disparate behaviors and policies, driven empirically by political, social or financial issues. If the decision process is not explicit and based on rational criteria (that is to maximize the health benefit at the lower cost), pharmaceutical companies as well as other medical industries or even nonprofit organizations could be discouraged to provide information regarding cost-effectiveness of interventions that they provide or promote.

Some actions can be taken in order to improve both quality and quantity of economic evaluations available in Argentina. For instance, a mandatory requirement to sponsors of new drugs or medical devices to provide evidence on cost-effectiveness is a regulatory intervention that has been applied in the past in several countries, including Argentina. In 2003, the National Ministry of Health passed a decree requiring sponsors of technologies to present information regarding clinical and cost-effectiveness, potential budget impact and local studies if existed, for every new drug, device, clinical or surgical practice or procedure requested to be incorporated in the ‘Compulsory Medical Plan’ or PMO in its Spanish acronym [37].
Economic evaluations on cardiovascular preventive interventions in Argentina

Unfortunately, in 2006 this decree was revoked after a change in the authorities of the Superintendence of Health Services of the Ministry of Health, leaving the adoption of new technologies without a regulatory framework to monitor clinical or cost-effectiveness [36]. On the other hand, quantity and quality of economic evaluations could be increased if local authorities and decision makers highlight some preferences as well as other relevant information involved in their decision process (i.e., measures of benefits and costs, willingness to pay and thresholds, time preference for money and so on). In this sense, some other Latin American countries such as Cuba, Brazil, Colombia and Mexico have developed guidelines to promote the development of economic evaluations in those countries [38]. These recommendations not only facilitate economic research but also set quality standards to enhance their realization and use. This kind of research recommendations could be easily developed by other developing countries such as Argentina. Availability of economic evaluations to local decision makers could also be improved by creating a public national registry of economic evaluations. Finally, a local source of funding specially aimed to support economic evaluations of health technologies should be available for local researchers.

Several global health initiatives aimed to create awareness and to provide evidence in order to combat the chronic diseases epidemic in low- and middle-income countries are already in progress. A high proportion of them are funded by international organizations and organizations from high-income countries, such as the Global Health Initiative of the National Heart, Lung and Blood Institute (NHLBI) from the USA [103] and the United Health Chronic Disease Initiative. In 2009, the Southern cone of America Center of Excellence for Cardiovascular Health, based on the Institute for Clinical Effectiveness and Health Policy in Buenos Aires, Argentina, was created with funding from the NHLBI and aimed to carry out and promote epidemiological and economical research on CVDs in Argentina, Chile and Uruguay [104,105]. Now it is time for local authorities and local decision makers from Argentina (as well as from other low- and middle-income countries) to be more aware of and to take advantage of initiatives like these.

Five-year view

Economic evaluations in general (and particularly in cardiovascular prevention) have a promising future for development in Argentina. In this sense, eight out of nine studies included in this review were published in the last 7 years, and three of them were published in 2009. This shows a recently established field of research in Argentina, with a positive tendency to growth. However, future development of health economic evaluations in Argentina will depend on the role that local authorities and health decision makers assume in the next few years.

Financial & competing interests disclosure

Lisandro Colantonio is Fogarty International Clinical Research Fellow (FICRF) 2009–2010. The Fogarty International Clinical Research Fellows Program is supported by the National Institute of Health Office of the Director, Fogarty International Center, Office of AIDS Research, National Cancer Center, National Eye Institute, National Heart, Blood, and Lung Institute, National Institute of Dental & Craniofacial Research, National Institute On Drug Abuse, National Institute of Mental Health, National Institute of Allergy and Infectious Diseases Health, through the International Clinical Research Fellows Program at Vanderbilt Institute for Global Health, Vanderbilt University in Nashville, TN (R24 TW007988). The authors have no other relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript apart from those disclosed.

No writing assistance was utilized in the production of this manuscript.

Key issues

• Cardiovascular diseases (CVDs) represent the leading cause of premature death throughout the world and at least 80% of them are potentially preventable.
• Argentina is an upper middle-income country located at the southern cone of South America. In 2006, CVDs (mainly coronary heart disease, stroke and heart failure) caused 34.2% of all deaths and 12.6% of total years of potential life lost.
• A literature search was conducted in order to identify complete health economic evaluations addressing interventions on primary or secondary prevention of CVDs on the Argentinean population.
• Nine complete health economic evaluations addressing 14 comparisons for primary or secondary cardiovascular prevention on the Argentinean population were identified in this review.
• Interventions oriented to primary or secondary prevention in patients that have undergone coronary angioplasty, with previous cardiovascular events or equivalents, hospitalized for heart failure or general population were evaluated.
• Bread salt reduction, antihypertensive medicines, mass educational campaigns and multidrug or polypill strategies included in the studies evaluated could be considered cost effective according to authors’ assumptions.
• More research was expected to be done in this area taking into account that CVDs are the main cause of morbidity and mortality in the country.
• In Argentina, health resource allocation decision processes, especially on cardiovascular prevention, appear to be driven empirically more than based on scientific evidence.
• Actions to improve quantity, quality and availability of economic evaluations on cardiovascular prevention could involve: requiring sponsors of new technologies to provide evidence on cost-effectiveness, developing guidelines, creating a national public registry and direct funding.
The overall aim of this paper is to examine whether economic evidence in favor of primary prevention on cardiovascular diseases does exist, and if so, what are its main characteristics, weaknesses and strengths.

1. **References**

Papers of special note have been highlighted as:

- of interest

2. [2] Burden of cardiovascular disease worldwide is estimated and addressed in this paper.
4. [4] DCPP is available at [website].
6. [6] DCPP chapter 45 analyzes the cost–effectiveness of relevant interventions aimed to control the impact of high blood pressure, cholesterol and bodyweight.
7. [7] DCPP is available at [website].

Economic evaluations on cardiovascular preventive interventions in Argentina

Review


• In this study policy makers were interviewed to evaluate the extent of the use of economic evaluations in Argentina.


Websites

101 Supplementary Box 1 and Table 1 www.expert-reviews.com/toc/erp/10/4

102 Choosing Interventions that are Cost–Effective (WHO-CHOICE): country specific costs www.who.int/choice/country/en/index.html

103 UnitedHealth and NHLBI Collaborating Centers of Excellence www.nhlbi.nih.gov/about/globalhealth/centers/index.htm


106 Disease Control Priorities Project www.dcp2.org/pubs/dcp