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# THE VALUE OF SOCIALIZED MEDICINE: THE IMPACT OF UNIVERSAL PRIMARY HEALTHCARE PROVISION ON MORTALITY RATES IN TURKEY

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The Value of Socialized Medicine: The Impact of Universal Primary Healthcare Provision on Mortality Rates in Turkey
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## ABSTRACT

This paper examines the impact of universal, free, and easily accessible primary healthcare on population health as measured by age-specific mortality rates, focusing on a nationwide socialized medicine program implemented in Turkey. The Family Medicine Program (FMP), launched in 2005, assigns each Turkish citizen to a specific state-employed family physician who offers a wide range of primary healthcare services that are free-of-charge. Furthermore, these services are provided at family health centers, which operate on a walk-in basis and are located within the neighborhoods in close proximity to the patients. To identify the causal impact of the FMP, we exploit the variation in its introduction across provinces and over time. Our estimates indicate that the FMP caused the mortality rate to decrease by 25.6% among infants, 7.7% among the elderly, and 22.9% among children ages 1-4. These estimates translate into 2.6, 1.29, and 0.13 fewer deaths among infants, the elderly, and children ages 1-4, respectively. Furthermore, the effects appear to strengthen over time. We also show evidence to suggest that the FMP has contributed to an equalization of mortality across provinces. Finally, our calculations indicate that each family physician saves about 0.15, 0.46, and 0.005 lives among infants, the elderly, and children ages 1- 4 per province every year.

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*"I regard universal health coverage as the single most powerful concept that public health has to offer. It is inclusive. It unifies services and delivers them in a comprehensive and integrated way, based on primary healthcare."*

-Dr. Margaret Chan, WHO Director-General, December 2012[1]

## 1. Introduction

One of the most daunting challenges faced by governments around the world is the provision of basic, accessible, and affordable healthcare services to their citizens. According to the World Health Organization (WHO), there are about 1.3 billion people in the world lacking effective and affordable medical care.[2] The majority of these people live in developing countries, which confront especially steep challenges due to shortages of trained healthcare personnel, infrastructure, and financial resources necessary to establish a universal healthcare system.[3]

Despite these challenges, a growing number of low- and middle-income countries have undertaken significant health interventions aimed at improving the delivery of basic healthcare care services, expanding access, and reducing health disparities, and ultimately improving public health. To this end, the most commonly adopted approaches are primarily demand-side measures, such as expanding public health insurance to previously uninsured individuals (typically low-income households), reducing user fees and out-of-pocket expenditures (or means testing to enhance affordability), and conditional cash transfers.[4] Previous studies find evidence that these interventions are usually effective at

[1] Opening remarks at a member state consultation on health in the post-2015 development agenda Geneva, Switzerland. See http://www.who.int/dg/speeches/2012/mdgs_post2015/en/ for the full speech (last accessed on March 10, 2017).

[2] See http://www.who.int/bulletin/volumes/86/11/07-049387/en/ (last accessed on March 10, 2017).

[3] Recognizing this challenge, the member states of WHO passed a resolution in 2005, encouraging countries to reform their health-financing systems with the goal of achieving universal coverage (WHO, 2005).

[4] See Arroyave et al. (2013), Bernal et al. (2016), Bitrán et al. (2010), Camacho and Conover (2013), Cercone et al. (2010), Cheng and Chiang (1997), Dow and Schmeer (2003), Ekman et al. (2008), Gruber et

extending coverage of public health insurance and increasing healthcare utilization, at least among targeted groups.[5] However, the evidence on whether these interventions promote affordable, high-quality health services, and improve health outcomes is relatively mixed and inconclusive.[6] A potential explanation for this conclusion is that expanding coverage—not surprisingly—would increase patient-doctor contact, but without provisions to ensure affordability and efficacy of treatments, it is possible that patients might be recommended services that are unaffordable, as well as medically unnecessary or even inappropriate (Miller et al., 2013; Limwattananon al., 2015). Consequently, demand-side reforms alone may not be effective in promoting affordable healthcare and expanding utilization unless they are accompanied by supply-side measures such as public provision of healthcare or incentives for providers to deliver cost-effective care. Accordingly, several recent studies have emphasized the role of supply-side interventions as a complement to demand-side reforms in countries like Brazil (e.g., Rocha and Soares, 2010; Reis, 2014), Colombia (e.g., Camacho and Conover, 2013; Miller et al., 2013), Peru (Bernal et al., 2016), and Thailand (e.g., Gruber et al., 2014; Limwattananon et al., 2015). The emerging consensus from these studies is

al. (2014), Kondo and Shigeoka (2013), Limwattananon et al. (2015), Mensah et al. (2010), Miller et al. (2013), Paim et al. (2011), Peabody et al. (2014), Pfutze (2014), Reis (2014), Rocha and Soares (2010), Ruiz et al. (2007), Somanathan et al. (2013), Sosa-Rubi et al. (2009), Thornton et al. (2010), Wagstaff (2007), and Wagstaff et al. (2009).

[5] It is important to note that health insurance schemes in the classic sense (i.e., premium based and pooling of risk) typically fail in low- and middle-income countries (e.g., Dreschsler and Jutting, 2007), and the health insurance schemes in most of the developing countries listed here are entitlement programs (i.e., tax financed with no or little premiums or user fees). To be fair, some include highly subsidized contributory options for `non-poor' target populations, but these options usually account for a very minor segment of the program beneficiaries.

[6] See Giedion and Diaz (2010) and Nicholson et al. (2015) for a discussion.

that healthcare interventions integrated with supply-side instruments typically improve both medical care utilization and public health.[7]

In this paper, we study the impact of a primarily supply-side healthcare intervention implemented in Turkey on outcomes of age-specific mortality rates. The Family Medicine Program – called FMP hereafter – extended basic healthcare services to the entire Turkish population under a free-of-charge and single-payer system that is fully financed and administered by the central government. The key operational feature of the FMP is the assignment of each Turkish citizen to a specific family physician, who offers a wide range of basic healthcare services in easily accessible walk-in clinics called Family Health Centers. The program was first initiated as a pilot in 2005 in the province of Duzce, and gradually expanded to cover the entire population in all 81 provinces by the end of 2010.[8] In 2013, there were over 21,000 family physicians – all public employees – in 6768 and 971 family and community health centers, respectively.[9]

There are a number of factors motivating our investigation. First, there is descriptive evidence crediting the FMP with increased patient satisfaction and healthcare utilization (Baris et al., 2011; WHO, 2008), but there has been no rigorous evaluation of the impact of the program on measures of public health outcomes.[10] This is despite the universal scope and scale of the Turkish program that makes it arguably one of the most

[7] Note that there is a wide spectrum of health outcomes considered in the literature ranging from chronic conditions to self-reported health, to patient satisfaction to mortality. Therefore, the findings from one particular study may not be generalizable to other outcomes. Furthermore, given the relative paucity of studies focusing on primarily supply-side reforms, the debate surrounding the impact of these reforms is not yet settled.
[8] Law No. 5258 on Family Medicine Pilot Implementation.
[9] See http://ailehekimligi.gov.tr (last accessed on March 10, 2017)
[10] It could also be very informative to conduct a comprehensive evaluation of the impact of the FMP on utilization levels. Unfortunately, we cannot perform such an analysis due to a lack of data on province level utilization levels.

ambitious and comprehensive efforts to achieve universal health coverage in a developing country setting.

Second, there are a number of distinct features that distinguishes the FMP from most other interventions. Perhaps the most unique component of the program is the assignment of every Turkish citizen, regardless of income, to a designated family physician who works as a public employee and provides a wide range of primary care services free-of-charge. This feature constitutes the backbone of the Turkish reform that separates it from most supply-side measures implemented elsewhere. Our paper presents the first evidence of the impact on mortality of entitlement to free basic healthcare coverage granted to the entire population using a publicly funded and operated system.

The universal and free aspect of the FMP deserve further highlighting because there appears to be a growing conviction among leading global health organizations, policymakers, and practitioners about the importance of achieving universal health coverage, i.e., ensuring basic and affordable healthcare services to whole citizens irrespective of their ability to pay (Nicholson et al., 2015; Rottingen et al., 2014; United Nations Sustainable Development Solutions Network, 2014; Wagstaff, 2014; WHO, 2014a). According to this view, a key step towards universal coverage is to extend an affordable and basic package of healthcare services to all citizens—as opposed to an approach that prioritizes specific target populations (e.g., the poorest in the society or people in informal employment)—that includes a broad range of basic services (Nicholson et al., 2015; Rottingen et al., 2014). However, this endorsement mainly comes from the mixed success of insurance-based interventions in achieving universal coverage or improving health. Therefore, the Turkish FMP presents a valuable opportunity to provide fresh insights into the impact of a nationwide and predominantly supply-side intervention on population health.

Finally, we also consider our analysis as a contribution to the broader literature on the relationship between income and mortality. Mortality, especially among infants, has fallen in many developing countries with the rise in income over the past several decades. However, it is not clear the extent to which this decrease has been due to increased income versus public provision of healthcare services from reforms similar to the one implemented in Turkey.

Exploiting the staggered program rollout across provinces and over time in a difference-in-differences empirical design, we find that the FMP led to considerable reductions in age-specific mortality rates. Our estimates indicate that on average the FMP reduced mortality rates by 25.6% among infants, 7.7% among the elderly, and 22.9% among children ages 1-4. The estimates appear to be small initially and to grow over time. This is consistent with the notion that the program has become more effective over time, possibly due to an increasing number of citizens establishing contact with their family physician and utilizing healthcare services. Furthermore, the results are suggestive that the program has also contributed towards reducing the disparity in mortality rates across provinces. Finally, our calculations indicate that an additional family physician saves about 0.15, 0.46, and 0.005 lives among infants, the elderly, and children ages 1-4 per year.

## 2. Literature

There is a large literature examining various aspects of healthcare reforms implemented in low- and middle-income countries. Although the majority of these reforms consist of primarily demand-side measures such as expanding public health insurance coverage, many of them are also accompanied by supply-side ingredients aimed at expanding coverage through public provision of services and thereby enhancing affordability, especially among the poor, and promoting cost-efficient, high-quality care through incentive-based payment mechanisms. In this literature review, we deliberately limit our discussion to relatively recent studies that consider reforms with pre-dominantly supply-side measures, as we believe these are the most relevant from the perspective of the Turkish program.[11]

One notable example is Thailand's 30 Baht Program (or Universal Coverage Scheme), which was launched in 2001 as one of the largest and most ambitious health reforms ever undertaken in a developing country at the time. With the goal of reducing geographical disparities in the provision of public healthcare, the 30 Baht Program significantly increased payments to hospitals and decreased co-payments to improve access to medical care for the poor. Gruber et al. (2014) examined the impact of the program employing a difference-in-differences estimator for identification by comparing the outcomes of the previously uninsured and underinsured populations to those who had insurance coverage prior to the reform. The authors found that the reform led to increased healthcare utilization with more pronounced effects among the poor, including a significant decrease in infant mortality, leading to a reduction in disparities of mortality across provinces. More recently, Limwattananon et al. (2015) employed a similar empirical strategy to examine the impact of the Thai reform on out-of-pocket medical

[11] Therefore, this is not an exhaustive list of the studies in the literature.

expenditures and utilization, and found that the reform reduced these expenditures while also raising utilization of both inpatient and ambulatory care.

Another relevant example with clear supply-side components is Colombia's Subsidized Regime, which was introduced in 1993 in the form of publicly-financed health insurance for the poor. The reform also introduced new payment contracts between insurers and provider organizations with a goal of creating incentives for providers to reallocate spending from primary to preventive care (Miller et al., 2013). In a recent study, Camacho and Conover (2013) used program eligibility as an instrumental variable to examine the effect of the program on access to medical care and birth outcomes, and found that receiving subsidized health insurance increased the likelihood of medical care utilization and reduced the incidence of low birth weight. Relatedly, using a fuzzy regression discontinuity design, Miller et al. (2013) found that the program protected the poor from financial risks associated with unexpected medical costs while increasing the use of traditionally-underutilized preventive services, resulting in health gains.

Peru's public health insurance program (Seguro Integral de Salud) is another large-scale reform with supply side incentives. Introduced in 2001, the program offered free (no co-payments, coinsurance, deductibles, or other fees) access to basic services through a network of healthcare centers and hospitals. Bernal et al. (2016) used the program's income eligibility thresholds in a sharp regression discontinuity design to examine the program's effect on utilization, healthcare expenditures, and health outcomes. They found strong positive effects on healthcare utilization, including receiving surgery, doctor visits, and receiving medication.  However, with the exception of pregnancy care, they obtained weak or no effects on preventive-care outcomes such as receiving iron supplements, ultrasounds, and lab tests. Interestingly, they also found that the program increased healthcare expenditures, but mostly at the high end of the income distribution, with no clear effects on self-reported health overall. Taken together, the authors interpreted these findings as evidence that an initial contact with a provider might lead to greater awareness about health problems, which might in turn trigger supplier-induced demand, and thus cause an increase in out-of-pocket spending for services not covered by the program.

Brazil's Programa Saùde de Familia (PSF) is another large-scale healthcare reform that deserves our attention. As one of the earlier reforms in the developing world, the PSF was launched in 1994 with the goal of promoting preventative and basic healthcare through the use of professional healthcare teams directly intervening at the family and community level. Rocha and Soares (2010) examined the impact of the PSF on a wide range of outcomes including mortality, child labor, schooling, employment, and fertility using both municipality and household data. Controlling for location fixed effects to account for the endogeneity of the program implementation, the authors found that the PSF reduced infant mortality, lowered fertility, increased the labor supply of adults, and boosted school enrollment in the North and Northeast regions of Brazil.

It is important to note that a key aspect of the PSF is the deployment of professional community healthcare teams, which are responsible for the delivery of primary healthcare (Rocha and Soares, 2010). This resembles the role of family physicians in the FMP who are responsible for providing basic healthcare services to the citizens assigned to them. But unlike the Turkish reform, participation in the PSF is voluntary at the municipality level and requires the coordination among all three layers of government at the federal, state, and municipal levels (Rocha and Soares, 2010). Consequently, it took over a decade, starting in 1994, for most municipalities to implement the policy, and the policy was not uniformly adopted as jurisdictions had discretion in its implementation. Financial constraints, technological challenges, funding and physician shortages, and the lack of political will to help people in rural areas also slowed down the expansion of the PSF in certain areas (Macinko and Harris, 2015; Noronha, 2010; WHO, 2008).[12] While the slow roll out of the policy may be problematic for several reasons, one particular concern is the endogeneity of the timing of the policy due to its voluntary nature. Moreover, there is also evidence that the initial focus of the program was poorer-than-average municipalities, so the roll out of the program was not random (Macinko and Harris, 2015; WHO, 2008). As a result, the expansion of the program to upper income groups, or even the middle-class, has been relatively slow. The FMP in Turkey, therefore, represents an ideal opportunity to overcome several of the endogeneity concerns affecting previous studies, thereby gaining greater precision in terms of the effects of supply-side healthcare reforms.

Another key difference between the two reforms is that in Brazil one of the tasks of health-care teams is to establish links between patients and other social programs such as conditional cash transfer programs, water and sanitation services, law enforcement,

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[12] One potentially satisfactory way to deal with these issues could be to adopt a more flexible functional form within a difference-in-differences strategy, for example, by relaxing the "parallel trends" assumption between the treated and control municipalities via time trends. Rocha and Soares (2010) state that they could not implement this type of a sensitivity analysis due to the significant loss in the degrees of freedom, given that their data include a large number of municipalities. Instead, they allow for state-specific year dummies. Recently, Reis (2014) deals with these selection issues exploiting variation in the PSF's availability across siblings in order to account for unobserved family as well as municipality level factors that are constant over time. Unlike Rocha and Soares (2010), they find only weak evidence that the availability of the program at the municipality level is related to better health indicators of children in Brazil.

and schools (Macinko and Harris, 2015), whereas there is no such role assigned to family physicians in the Turkish program. Furthermore, the Brazilian program relies heavily on home visits initiated by health agents who are responsible for proactively identifying individuals within communities with healthcare needs and to reach out to them before they seek out care at clinics (Macinko and Harris, 2015). This process of linking patients with healthcare specialists in a proactive manner is likely to be endogenous, and may lead one to overestimate any positive impact of the program. In contrast, the FMP of Turkey is fully funded through general tax revenues, and provides primary healthcare services to all Turkish citizens, regardless of income, in Family Health Centers located within their local neighborhoods. Finally, the Brazilian program exhibits much wider variation in terms of quality and capacity of services provided, and only recently introduced a pay-for-performance scheme which has been a key component of the Turkish reform from the beginning.

While valuable lessons have been gained from the aforementioned reforms, several distinguishing characteristics of the FMP set it apart as a significant supply-side reform to study. To our knowledge, this paper constitutes the first evaluation of the impact of the FMP on health outcomes, measured by age-specific mortality rates. In the subsequent section, we describe the important features of the FMP in more detail.

## 3. The Family Medicine Program

The FMP was launched by the Ministry of Health of the Republic of Turkey, first as a pilot in the province of Duzce in 2005 and then gradually expanded to all 81 provinces by the end of 2010 (See Appendix Table 1 for a list of all provinces with their respective implementation dates). The program operates by assigning *each* Turkish citizen to a specific family physician who offers a wide range of primary healthcare services free-of-charge. This is the key operational feature of the FMP, and has been instrumental in the initial contact and the continuity of care as well as satisfaction and trust between the physicians and the patients (Baris et al., 2011; Worldbank, 2012; WHO, 2014b). Importantly, all family physicians are public employees. In terms of administration, the Public Health Institution of Turkey (PHIT) is responsible for the oversight and broad management of the FMP. Moreover, in each province, the PHIT has a Public Healthcare Directorate responsible for operations at the local level (OECD, 2014).

The family physicians are recruited from several sources including the existing pool of general practitioners, specialists within both the private and public sectors, and recent graduates from medical schools. Specialists within both the public and private sectors are allowed to join the FMP and those in the public sector could also exercise a leave of absence from their current position for a period of two years to work as a family physician (Worldbank, 2013b). With respect to new graduates, almost every medical school in Turkey established departments of family medicine that offer a three-year specialty training program (OECD, 2014). In order to meet a certain threshold of quality standard, existing general practitioners and recent graduates of medical schools interested in joining the FMP are required to complete a two-phased training program, including a ten-day orientation administered in person, followed by a one-year distance-learning program administered while working (OECD 2008, 2014; WHO 2012a). Between 2005 and 2011, approximately 45,000 GPs joined the FMP by going through these training programs (Akdag, 2011).

The compensation package established as part of the FMP was also designed to recruit high-quality physicians. For example, a capitation plus performance-based payment system was introduced at the beginning of the program in order to allow family medicine physicians to raise their salary by between 150 and 800% (Akdag, 2011).[13] Furthermore, family physicians are required to meet pre-determined performance targets in maternal and child health with regards to immunization, antenatal care, and follow-up visits of registered new born babies.[14] Failure to meet these targets can result in a salary deduction of up to 20%, and repeated failures could result in contract termination. In addition, an internet-based platform was established for family physicians to provide data on maternal and child health activities, such as vaccinations and antenatal care to the health information systems directorate at the Ministry of Health, which then provides feedback on the target thresholds. Additionally, contracts include a point-based warning and admonition system for violations of 35 pre-defined indicators, such as abiding with working hours, and maintenance and security of patient health records. Family physicians with penalty points exceeding 100 within a contract period have their contracts terminated and are not allowed to apply for a new contract. Auditors from Community Health Centers assess compliance and quality of service of Family Health Centers at least once every six months, and a group of family physicians are randomly selected for performance audits every month. Finally, in order to provide ongoing training, an internet-based open platform was established for physicians to interact with each other

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[13] Also see http://ailehekimligi.gov.tr/sk-sorulan-sorular/personel-cin.html ( last accessed on March 10, 2017).

[14] Additionally, a set of performance indicators for chronic and non-communicable diseases, such as screening for hypertension, obesity, and cancers, and control of blood pressure in hypertensive patients have been moderately integrated into the performance-based payment scheme over time (Worldbank, 2013b).

and to facilitate peer-to-peer learning, which has served to improve quality of services (Worldbank, 2013b).

In terms of coverage of medications, patients are responsible for a 20% copayment for out-patient pharmaceuticals.[15] The copay is 10% for retirees. However, the cost is fully covered if the price is less than the reimbursement limit (capped at 22% over the least expensive brand), implying that most generics are fully covered, with patients paying the difference between the actual cost and the cap if they choose brand-name drugs. Furthermore, in-patient pharmaceuticals and medications for patients with (physician confirmed) chronic diseases (e.g., diabetes, hypertension, cancer) are fully covered (Celik and Seiter, 2008; Tatar et al., 2011). Contraceptives, such as birth control pills and condoms are provided free-of-charge, whereas intrauterine devices are provided at a subsidized price (Bernar-Dilbaz, 2010; Karaguzel, 2006).

The FMP services are delivered through two primary channels: Family Health Centers (FHCs) and Community Health Centers (CHCs). The FHCs staff family health teams formed by at least one family physician and an equal number of family health personnel including nurses and midwives. Basically, the FHCs are the clinics where patient-specific preventive care services (immunization and monitoring of pregnant women and infants) and diagnostic, curative, rehabilitative, and counseling services at the

[15] Prescription drugs and medical supplies are primarily purchased from nearby pharmacies as in most developed countries. Establishing a pharmacy requires licensing by the government, and officials allocate a larger share of new licenses in areas with relatively low concentration of pharmacies on a per capita basis (Celik and Seiter, 2008; Tekiner, 2013). On average, there is one pharmacy per 3000 people (Celik and Seiter, 2008; Tekiner, 2013). In remote and rural areas, where it is commercially less attractive and viable to establish a pharmacy, mobile pharmacies are set up by the government to make it easier for citizens to access to medications (Turkish Ministry of Health, 2010). Moreover, the Turkish Pharmaceutical Track-and-Trace System (ITS) monitors the pharmaceutical market to ensure reliable supply of drugs to patients (Unal, 2016). Family physicians are also able to provide pharmaceuticals in their own facilities in the case of emergencies, as well as vaccinations for infants and children, which are provided free-of-charge by family physicians (Turkish Ministry of Health 2010).

primary care level are provided. These centers serve as easily accessible walk-in clinics as they are located within the neighborhoods where assigned citizens reside. Services can be obtained by simply presenting an identification card without having to make an appointment or to present any form of health insurance.

The CHCs, on the other hand, are established to provide logistical support to family physicians for public health services such as vaccination campaigns, health promotion and education services, and environmental and occupational health services. Moreover, the CHCs collect statistical data on public health services, and monitor and evaluate the effectiveness of health services provided by the FHCs**.** Both the FHCs and CHCs operate under the supervision of the Provincial Health Directorates that are responsible for planning and provision of health services at provincial level and accountable to the PHIT.

Prior to the FMP, the delivery of primary healthcare services had been managed through a highly hierarchical and fragmented system, which was difficult for patients to understand and navigate through.[16] Launched in 1992, the Green Card—the "Yesil Kart"—program was the flagship social protection mechanism that targeted the poor. The Green Card program, a means-tested, noncontributory national health insurance scheme for the poor, covered only inpatient treatment costs of the eligible beneficiaries in public

[16] Under the Green Card Program, Turkish citizens living within the borders of the Republic of Turkey could be eligible if i) they were not covered by any social security schemes and ii) they have per capita household incomes of less than one-third of the gross minimum wage (except for taxes and social security premiums). Moreover, pensioners over 65 years old and people with chronic illnesses could be eligible, regardless of their household incomes (Worldbank, 2013a). The benefits of the program were expanded under the FMP: outpatient services (in 2004) and prescription drugs (as of January 2005) in public facilities were included in the benefits package. In 2012, the Green Card program was integrated into the universal health insurance scheme (Worldbank, 2013a). Limiting the analysis sample to 2001-2012 or 2001-2011 produces a similar pattern of results. The nationwide expansion of the benefits over time improved utilization of healthcare services among the poor. Note that our paper controls for common trends in order to identify the effect of the FMP.

facilities until 2004. Among the non-poor, health insurance was publicly provided based on occupational type. Among these disparate insurance plans, there was significant variation with respect to coverage and price of health services, the types of healthcare providers that were allowed to cover, and payment programs including co-payments and other fees (Atun, 2015; Robila, 2013). Moreover, even when individuals had nominal health insurance, many lacked access to healthcare providers and dispensaries, particularly in rural areas, and healthcare providers also lacked staff and operational resources (OECD, 2008). Accordingly, there were wide disparities in access and quality of primary healthcare services. The FMP harmonized the coverage of healthcare services to all citizens regardless of occupation or income, which were all provided free-of-charge, under the unified Social Security Institute (SSI). The primary healthcare benefits package includes a wide range of primary healthcare services with a particular focus on maternal and child health, and the elderly (WHO, 2012a; WHO, 2012b).[17]

Many individuals relied on hospitals as their source of primary care prior to the FMP, and this has been shown to overburden hospitals generating over-crowding and long-waiting times (Baris et al, 2011; OECD, 2008; Tatar et al., 2011). While reducing waiting times at secondary-level facilities was not a major goal of the program, the FMP directly encouraged greater utilization of primary care facilities as a first point of contact, thereby reducing pressure on secondary-level facilities. For example, the FMP waived co-payments at secondary-level facilities only if patients had a referral from their primary care family physician (OECD, 2008; Tatar et al., 2011). There is qualitative evidence to suggest that the introduction of the FMP led to better access and shorter waiting times

[17] Also see http://ailehekimligi.gov.tr/aile-hekimlii/aile-hekimliinin-tanm.html (last accessed on March 10, 2017).

among those seeking primary care services, while at the same time improving the quality of care by providing a relief on overburdened hospitals (Akdag, 2008; Dagdeviren and Akturk, 2004; OECD, 2008; Vujicic et al., 2009; WHO 2012a). Consequently, outcome quality for hospital care as measured by patient satisfaction increased substantially between 2003 and 2010 from 39.5% to 73.1% (Tatar et al. 2011).

The FMP also included health services aimed at prevention, early detection, and management of non-communicable diseases (NCDs).[18] Prior to the FMP, health services related to prevention and management of NCDs were only provided at hospitals, and high co-payments were often a barrier (OECD, 2008). Cancer and hypertension screening, blood pressure control in hypertensive patients, and blood glucose control in diabetic patients are provided free-of-charge by family physicians. Moreover, family physicians are allowed to prescribe anti-hypertensive drugs (except for angiotensin receptor blockers), anti-diabetic drugs (except for insulin), and cholesterol lowering drugs (after specialist recommendation), which are also free-of-charge (WHO, 2014b).

Finally, family physicians may also change health behaviors of mothers by providing information to mothers concerning the importance of hygiene, and encourage basic sanitation techniques to prevent infectious diseases. They can also provide parents with information about how to treat and prevent diarrhea using simple methods, which may help reduce mortality, especially among infants (Gürel, 2009; Hisar and Hisar, 2012; Suluhan et al., 2014).[19]

[18] NCDs accounted for approximately 86% of all mortalities in Turkey in 2012, mainly due to cardiovascular diseases (47%) and cancers (22%) (WHO, 2014c).
[19] Given the reduced-form research design of our analysis, we are not able to identify the exact channels through which the FMP influences mortality rates.

## 4. Data

We gathered data from several sources to examine the effect of the FMP on age-specific mortality rates between 2001 and 2014. Information on the FMP was obtained from the PHIT. Our treatment variable is constructed in a number of alternative ways. First, we generate a binary indicator for the presence of the FMP in a particular province in a given year. Next, we employ a continuous measure defined as the number of years since the implementation of the FMP in order to explore any dynamic patterns in the relationship between the program and the outcome measures. Finally, we consider a non-parametric relationship between the FMP and mortality by employing separate binary indicators for post-implementation years from 1 to 5 and beyond. In Appendix Table 1, we present the year of implementation of the FMP as well as the number of citizens per family physicians for year 2013. The PHIT aims to provide one family physician for about every 3500 persons in a province, and the evidence suggests that this goal has been achieved rather rapidly following the introduction of the program (Dogac et al., 2014; Öcek, 2014; Tirpan, 2010; Worldbank, 2013c).[20]

Data on age-specific mortality rates come from the Turkish Statistical Institute (TurkStat). All-age mortality rate (*AMR*) represents the number of deaths per 1000 people. Infant mortality rate (*IMR*) reflects the number of deaths among infants up to 12 months of age per 1000 live births. Child mortality rate (*CMR*) pertains to the number of deaths per 1000 children between the ages 1 and 4. Finally, the elderly mortality rate (*EMR*) represents the number of deaths per 1000 people among those who are at least 55 years of age.

[20] See also http://ailehekimligi.gov.tr/sk-sorulan-sorular/personel-cin.html (last accessed on March 10, 2017).

We account for several time-varying determinants of mortality measured either at the province or sub-regional level in the analysis. Note that Turkey is classified into 12 regions and 26 sub-regions in addition to 81 provinces by TurkStat. These control variables represent characteristics that may affect mortality either directly or may be correlated with other factors that may influence mortality.[21] The full list includes the number of students per teacher in primary schools, the number of motor vehicles per 1000 persons, the unemployment rate, income per capita, the percentage of population with at least a high school degree, and the percentage of population with at least a college degree.[22] In addition, we also control for the percentage share of seats controlled by the governing party in the parliament for each province to account for the possibility that the FMP might have expanded across provinces in a way that is correlated with the timing of other investments by the government.[23] Information on age-specific province populations comes from the TurkStat. Finally, we include in our analysis binary indicators

[21] Income and related indicators of socio-economic development and urbanization have been shown to be related to population health including mortality (e.g., Cutler et al., 2006; Gerdtham and Ruhm, 2006). The underlying theory of the role of education and income in the health production process developed in the seminal work by Grossman posits that increased educational attainment and income related characteristics improve individual health through greater productive efficiency (Grossman, 1972). In other words, domestic product per capita (representing income) and education variables serve to shift the total product curve for medical care upward, so that at each level of medical care, more health (less mortality) is achieved.

[22] Among these variables, the first two are measured at the province level and the rest are only available at the sub-regional level. For variables that are measured at the sub-regional level, we use the same value for every province within the same sub-region. Therefore, there can be a maximum of 364 unique values for each year for each of these variables. These regional and sub-regional classifications are generated for statistical purposes based on geographic proximity and socio-economic similarities within the associated region. The TurkStat collects and processes data from different sources on a variety of topics including demographic characteristics and health. See http://www.turkstat.gov.tr for more information.

[23] Between 2001 and 2013, Turkey had three general elections (2002, 2007, and 2011), in which the members of the Grand National Assembly of Turkey were elected.

representing missing observations for each covariate. Our analysis sample consists of 1134 province-year observations between 2001 and 2014.[24]

It is well-known that official statistics on mortality from developing countries, especially those on infant mortality, suffer from considerable measurement error (Anthopoulos and Becker, 2010; Cesur, Tekin, and Ulker, 2016, 2017; Gruber et al., 2014). This measurement error is typically caused by factors such as difficulties in obtaining an accurate count of deaths due to religious and cultural practices observed in the burials of the dead, and the large number of births delivered at non-hospital settings. Therefore, the official statistics on infant mortality tend to under-represent the actual number of deaths. Recognizing the measurement error in the official data, international organizations like the United Nations and the WHO adjust for under-reporting by employing information from various sources such as official vital registries, census data, and demographic surveys (Gruber et al., 2014). This usually results in a discrepancy between the official mortality data released by national statistical agencies and international organizations.

In the present study, we only use data obtained from TurkStat because province level mortality statistics are not available from other sources. As demonstrated in Cesur, Tekin, and Ulker (2017), the trends in national infant mortality rates obtained from TurkStat data and the data from the United Nations and the WHO follow each other very closely. For example, the pairwise correlations in the infant mortality rate between TurkStat data and the series from the United Nations and the WHO are both 97%. The

[24] The numbers of missing observations are 243 for unemployment rate, percentage of population with a high school degree, and percentage of population with a college degree, 486 for income per capita, and 81 for number of students per teacher.

availability of FMP may cause a shift in deliveries from homes towards hospitals, which may then result in a decrease in infant mortality. This can be interpreted as a program effect. At the same time, such a shift from home births towards hospital deliveries may improve the accuracy of accounting in the number of infant deaths. In this case, one may still obtain an effect on infant mortality simply due to less under-reporting in infant deaths even if the FMP had no real impact on infant mortality. It is important to note that such bias would go against finding a negative impact of the FMP on mortality, especially for infants.[25]

Descriptive statistics on age-specific mortality rates and the control variables are presented in Panel A and Panel B of Table 1, respectively. As displayed in Panel A, the mortality rates are 10.6 and 0.6 per 1000 for infants and children between ages 1-4, respectively. The mortality rate for those aged 55 and older is 20.1 per 1000. A comparison between the subsample of observations with and without the FMP reveals that mortality rates are higher in the FMP provinces for all age categories.

As shown in Panel B of Table 1, the time-variant province characteristics also vary considerably between province-year observations with and without the FMP. For example, observations with the FMP appear to have a higher number of motor vehicles per 1000 persons, higher income and education, and smaller classrooms at schools. The pattern in these differences is consistent with the view that the pace by which the FMP has expanded might have been positively associated with a higher level of urbanization and economic development.

[25] Random measurement error in any of our outcome variables would lead to imprecision in our estimates.

## 5. Econometric Framework

Our approach to obtaining the causal impact of the FMP on mortality outcomes is to implement a difference-in-differences estimation strategy, taking advantage of the fact that the program was rolled out in a staggered basis across provinces and over time. In doing so, we compare the differences in the outcome variables in provinces before and after the FMP implementation net of those provinces without the FMP in place. This empirical strategy can be expressed by the following equation:

$$Y_{rpt} = \beta_0 + X_{rpt}\beta_1 + \beta_2 \, FMP^0_{rpt} + \beta_3 \, FMP^+_{rpt} + \delta_{rt} + \lambda_p + \varphi_p \, t + \varphi_p \, t^2 + \varepsilon_{rpt}, \quad (1)$$

where $Y_{rpt}$ is the logarithm of one of the age-specific mortality rates measured in province p in region r in year t. The vector $X_{rpt}$ represents time-varying province level characteristics. The FMP implementation is represented by two separate variables in Eq. (1). The $FMP^0_{rpt}$ and $FMP^+_{rpt}$ are binary indicators representing the year of implementation and all years following the year of implementation, respectively. This approach assumes that the impact of the FMP in the year of implementation may be different from subsequent years. The program impact in the year of implementation is expected to be smaller than all the subsequent years for two reasons. First, unless the program is launched on the first day of the year in every province, the length of time the FMP is in effect in the first year is a fraction of a full year. Accordingly, we expect the program impact to be a fraction of a full-year effect in the first year. Second, it would likely take some time for all program components to become fully operational, and for all citizens to identify and register with their designated family physicians. Based on this formulation, any program impact in the year of implementation is captured by the coefficient on $FMP^0_{rpt}$ and the program effect in all the subsequent years is represented by the coefficient on $FMP^{+}_{rpt}$.[26] As discussed, we will further relax the pattern in the relationship between the FMP and mortality by allowing for a more flexible specification.

The variable $\delta_{rt}$ is a set of region-by-year fixed effects. This is included in the model in an attempt to control for common trends and shocks to mortality that might be correlated with health investments including the FMP at the regional level. The region-by-year fixed effects would also account for time trends that are common across all provinces. Accounting for such trends is important because there have been a number of other health- and non-health related initiatives implemented during our analysis period, including the introduction of mobile pharmacy and helicopter-based emergency medical services to improve access to healthcare in rural areas. However, since these policies became effective nationwide concurrently, their effects should be captured by region-by-year fixed effects. The variable $\lambda_p$ represents province fixed effects accounting for permanent differences across provinces such as poverty as well as cultural and traditional practices, which likely remained time-invariant during the analysis period. The terms, $\varphi_p$ t and $\varphi_p$ $t^2$, represent linear and quadratic province-specific time trends, respectively. These trends would capture the influence of difficult-to-measure factors at the province level that trend either linearly or quadratically over time. Finally, $\varepsilon_{rpt}$ is the idiosyncratic error term. The parameters of interest in Eq. (1) are $\beta_2$ and $\beta_3$, which, respectively, represent the average change in the outcome of interest during and after the year of implementation of the FMP, net of any change in the outcome variable in control provinces.

[26] An alternative approach could be to define the treatment variable as a fraction of a binary indicator in the first year based on the month of implementation and assign a binary indicator for all other years. Unfortunately, we do not have information on the exact date of implementation of the FMP in each province. Our approach has been used previously to study program impacts in similar contexts. For example, see Courtemanche and Zapata (2014), and Kolstad and Kowalski (2012) as two recent applications in which the authors split the treatment indicator to separate its effects during implementation and afterwards in studying the impact of the Massachusetts healthcare reform.

The key identifying assumption in the difference-in-differences method is that in the absence of the FMP implementation, any mortality differences between the treatment and the control provinces would continue along the same trend. However, it is plausible that the provinces that are early adopters of the FMP began investing on health infrastructure on the years prior to the FMP implementation. In this scenario, these pre-existing trends could cause spurious positive correlation between the treatment and mortality. We relax the parallel trends assumption by successively including province specific linear and quadratic trends in Eq. (1). Controlling for these trends could serve a particularly important function by gauging these pre-existing differences in mortality trends across provinces.

If the set of fixed effects and province-specific trends described above do in fact capture the unobserved characteristics that may be correlated with both the FMP and mortality rates, then we would expect the time-varying characteristics included in specification (1) to be inconsequential in terms of influencing the effect of the FMP. One indirect way to test this is to consider the pairwise correlations between an indicator representing the presence of the FMP and these characteristics, and examine how these correlations change as we sequentially add the fixed effects and the trend terms. To do this, we regress time-varying province characteristics on a binary indicator variable for the presence of the FMP at the province level using various specifications. The estimates from these regressions are presented in Table 2A. Note that each cell in this table corresponds to an estimate from a separate regression. As shown in column (1) of Table 2A, there is considerable variation between provinces with and without the FMP as they differ along all of the observable characteristics including unemployment rate, number of vehicles per 1000 persons, per capita income, percent of population with a high school degree, and number of students per teacher. The evidence from Table 2A suggests that having the FMP at the province level is positively associated with characteristics that capture various dimensions associated with being more urban and socio-economically developed.[27] However, much of these differences disappear once we control for the time-varying differences across regions in column (2). However, it is really when we control for permanent differences across provinces through province level fixed effects, in column (3), all of the observable differences between the two types of provinces become unrelated to the FMP. In fact, none of the estimates in column (3) are economically or statistically significant. This pattern remains preserved when we add province-specific linear and quadratic time trends in columns (4) and (5), respectively.

Next, we repeat the same exercise by replacing the binary treatment indicator with a continuous variable representing the number of years lapsed since the FMP implementation. Estimates from these regressions, which are displayed in Table 2B, paint a picture similar to the one displayed in Table 2A. Specifically, province characteristics are significantly and sizably related to the number of years that the program has been in place in a province, suggesting a more rapid adoption of the FMP in provinces that are

[27] Although the program roll out does not appear to be random with respect to province characteristics, the FMP was introduced by the central government with the mandate to establish universal coverage eventually. Accordingly, the differences in the timing of implementation across provinces and over time primarily have to do with logistical and staffing considerations. In the end, all of the 81 provinces in Turkey had implemented the FMP during the analysis period. Therefore, there is no concern over selection bias that could be caused by certain provinces with a particular set of characteristics never getting the treatment. Furthermore, even if the implementation of the FMP appears to be non-random, any resulting bias could be eliminated by controlling for province fixed effects to the extent that the pattern of the roll out is only correlated with the pre-existing differences across provinces that are time-invariant (Rocha and Soares, 2010).

more urban and economically developed than other provinces. But again, this pattern disappears once we control for fixed effects and trends.[28]

The empirical model specified in Eq. (1) constrains the impact of the FMP on mortality to be homogenous in all years following its implementation. Accordingly, the results from this model may mask important differences in the dynamics regarding the evolution of the program impacts if the underlying relationships between the FMP and outcomes in consideration are not constant over time. As mentioned above, it may take some time for the FMP to become fully operational and effective since some citizens may not be aware of the program in the beginning, or may be reluctant to switch from their existing practices initially. It may also take a while before citizens identify their designated family physicians, learn about and get familiarized with the healthcare services available to them, and begin utilizing these services. Accordingly, the program effects may be felt gradually over an extended period of time. Regardless, this is a question that can ultimately be answered by modifying Eq. (1) in ways that would allow for a more flexible relationship between the FMP and the outcome measures. We consider two flexible specifications. First, we replace the binary treatment variable with a continuous measure defined as the number of years since the implementation of the FMP:

$$Y_{rpt} = \beta_0 + X_{rpt}\beta_1 + \beta_2 \text{ Years\_since\_FMP}_{rpt} + \delta_{rt} + \lambda_p + \varphi_p t + \varphi_p t^2 + \varepsilon_{rpt}. \quad (2)$$

Second, we consider a flexible non-parametric specification, in which we include separate dummy variables for various years since the implementation of the FMP:

[28] To gain additional insights about the pattern in which the FMP has expanded across provinces and over time, we also estimate the binary FMP indicator and the number of years since the FMP implementation measures on jointly specified time-varying province characteristics. This analysis indicates that province characteristics are initially significantly related to the FMP implementation even with all these characteristics entered into the model jointly. However, none of the estimates remain significant in both the statistical and the practical sense once we control for province fixed effects and province-specific trends. Full results from this analysis are available from the authors upon request.

$$Y_{rpt} = \beta_0 + X_{rpt}\beta_1 + \sum_{k=1}^{5+} \beta_k \text{ k\_years\_since\_FMP}_{rpt} + \delta_{rt} + \lambda_p + \varphi_p t + \varphi_p t^2 + \varepsilon_{rpt}. \quad (3)$$

We estimate all of our models using weighted regressions with province population for the relevant age category used as a weight.[29] Finally, we present standard errors that are robust to clustering at the province level, making statistical inference robust to arbitrary forms of both heteroskedasticity and serial correlation within provinces over time (Bertrand et al., 2004).

**6. Results**

We begin by presenting the estimates on the impact of the FMP indicators on the logarithm of age-specific mortality rates in Table 3. We report the mortality estimates for various age categories arrayed in columns (1) through (4) including all-age mortality rate, the infant mortality rate, the mortality rate for children ages 1-4, and the mortality rate among the elderly (age 55 and older). Focusing on Panel A of Table 3, in which we only control for province fixed effects and region-by-year fixed effects, we observe that the FMP is not significantly associated with any of the four measures of mortality during the year in which the program is launched. Furthermore, the estimates are all small in magnitude. As discussed above, this is not surprising since the FMP is in operation for only a fraction of a full year in its first year of implementation. While the FMP does not influence mortality in the year of adoption, it has a negative effect in all subsequent

[29] The results from unweighted regressions are very similar to those presented in this paper, though the coefficients are somewhat less precisely estimated. This is not surprising because there are several very low-densely populated provinces (these are provinces with fewer than 300,000 persons representing around 5% of all the country) for which the impact of the FMP is not representative of the program effect more generally. This is because the key operational feature of the FMP entails an initial contact between a family physician and each citizen, which presumably progresses into a continuous and long-term relationship with regular checkups at conveniently located neighborhood clinics. This relationship is likely to be more challenging to establish in these sparsely populated provinces. Therefore, not employing population weights would give undue influence to these small provinces in estimating the average effect of the FMP on the population. In fact, when we exclude these sparsely populated provinces from the analysis, the estimates become robust to not using weights.

years. As shown in the first row of Panel A, all four coefficients are negative and statistically significant. In panels B and C, we successively add province-specific linear and quadratic trends to the specification. As we control for province-specific linear trends in Panel B and quadratic trends in Panel C, the estimates on the FMP impact on the year of implementation remains small and statistically insignificant, but importantly changes sign with the exception of child mortality. Note that these trend variables would capture the influence of difficult-to-measure time-varying differences or differences in pre-existing trends across provinces. To the extent that these factors are correlated with the timing of a province implementing the FMP, the change in the sign of the treatment indicator in the year of implementation is not surprising. Regarding the program effect on all subsequent years, the estimates continue to remain negative and highly significant after accounting for these trends. Finally, Panel D adds time-varying characteristics measured at the province or sub-region level as described in Section 3. As expected, our estimates are robust to controlling for these observable characteristics. Focusing on point estimates for the program effect in the years following the year of implementation, the FMP is associated with an 11% ($e^{-0.112}$-1) decrease in the overall mortality rate. With a mean mortality rate of 2.95 per 1000 persons for the sub-sample without an FMP, this estimate implies that the FMP reduced mortality by about 0.32 per 1000 persons. Turning to age-specific mortality estimates, the impact of the FMP on infant mortality is 25.6% ($e^{-0.296}$-1), while the effect on the elderly mortality rate is 7.7% ($e^{-0.080}$-1). With the sample mean for infant mortality at 10.16 per 1000 infants and for the elderly at 16.70 per 1000 elderly persons, these estimates translate to reductions of mortality by 2.6 per 1000 among infants and 1.29 per 1000 among the elderly. Finally, the estimate of the impact of the FMP on child mortality rate is 0.260 per 1000, which is equivalent to a marginal effect of 22.9%. Despite the marginal effect being sizeable, the number of lives saved among children ages 1-4 is only 0.13 per 1000 due to the small number of deaths among this group in the baseline.

The results in Table 3 are derived from a specification that constraints the estimate of the impact of FMP on mortality to be the same in all years after the year of program implementation. This is a restrictive assumption if the FMP effect becomes more pronounced over time for the reasons described in the previous section. To explore any dynamic relationship between the FMP and mortality rates, we next turn to results from the estimation of the models specified in Eqs. (2) and (3). As shown in the top panel of Table 4, the impact of the FMP on mortality rate is statistically significant, negative, and increasing in absolute terms over time for all outcomes. In particular, each additional year of FMP implementation reduces the mortality rate by 23.7% ($e^{-0.271}$-1) among infants, by 24.8% ($e^{-0.286}$-1) among children ages 1-4, and by 7.7% ($e^{-0.080}$-1) among the elderly. Although the largest estimate is for the mortality rate among children ages 1-4, the actual lives saved by the FMP is again the lowest for this group of children due to a very small baseline mortality rate among them.

The dynamic nature of the relationship between the FMP and the mortality rate is more apparent in the bottom panel of Table 4, which shows results from a more flexible specification. These estimates indicate a strong and negative relationship between the FMP and mortality for all age groups. Furthermore, the effect appears to be persistent and accumulating over time, consistent with the notion that the program saves more lives the longer it is in effect.

The estimates presented in Tables 3 and 4 are based on specifications, which control for any unobservable province-level characteristics, and investments in healthcare that are trending linearly or quadratically over time. If these province-specific trends sufficiently capture pre-existing differences in mortality rates, then we should see no discernable impact of the FMP in the years prior to its implementation. One way to test whether this condition is satisfied is to conduct an event-study analysis, which allows us to trace out differences in mortality rates between treatment and control provinces in the periods leading up to and following the implementation of the FMP.[30] The results from this analysis are presented graphically in Fig. 1, and numerically in Table 5. For ease of illustration, estimates from the bottom panel of Table 4 are also presented alongside the event-study estimates in Table 5. As shown in Fig. 1 and the even-numbered columns of Table 5, the placebo effects – the estimates representing the periods prior to the FMP implementation - are all statistically insignificant, suggesting no evidence of differences in pre-existing trends in mortality rates across provinces once we account for province-specific trends in the regressions. It is also reassuring that, following the implementation of the FMP, the estimates of the impact of the FMP on mortality becomes stronger over time. This pattern is consistent with the estimates shown in Table 4. In fact, a comparison between the sets of estimates shown side-by-side in Table 5 suggests that they are largely in line with each other, especially after the second year of implementation of the FMP. Again, we ascribe this pattern to the notion that it takes some time for the positive program effects to emerge.

[30] See Cesur, Tekin, and Ulker (2017), Currie, Greenstone, and Walker (2015), Gershenson and Tekin (In press), and Hoynes, Miller, and Simon (2015) for recent examples of studies with an event-study analysis.

To gain further insights into the exact nature of the differences in pre-existing trends in mortality rates across the treatment and control provinces, we performed a series of sensitivity analyses. In particular, we obtained event-study estimates using several specifications, each of which assumes that the pre-existing trends follow a different structure. The results from these analyses are presented separately for each of the four mortality outcomes in Appendix Tables 2A-2D. For the sake of consistency with Table 5, we begin by showing estimates from a specification that imposes the treatment effect to be zero for all the time periods prior to the FMP implementation (column 1). Next, we present the estimates from a specification that allows for pre-existing trends to differ at the regional level by controlling for region-by-year fixed effects (column 2), followed by a specification that captures province-specific linear trends (column 3), and both linear and quadratic trends (column 4). In all of these specifications, we also account for permanent differences across provinces through province fixed effects, as well as time-varying characteristics either measured at the province or sub-regional levels. As indicated by the estimates in columns 2 and 3 of Appendix Table 2A, there appears to be pre-existing trends in all-age mortality rate that are not fully captured by region-by-year fixed effects or province-specific linear trends. It is only after we account for province-specific quadratic trends in column 4 that these pre-treatment trends become indistinguishable from zero. As shown in Appendix Tables 2B-2D, this pattern is similar for infant, child, and elderly mortality rates. The evidence from this exercise suggests that there are indeed differences in mortality rates across provinces that are time-varying and trending quadratically. We view this as evidence that, in order to obtain credible estimates of the impact of FMP on mortality, it is important to account for these differences in the analyses.

The results discussed so far assume that the impact of the FMP on mortality rates does not depend on initial levels of mortality. However, as the program allowed all citizens to gain access to free public healthcare regardless of their current insurance status or ability-to-pay for care it is possible that even small improvements in access to healthcare could generate meaningful health benefits among provinces with poorer initial health conditions. To test whether the effect of the FMP differs by baseline mortality levels, we estimated the specifications shown in Tables 3 and 4 separately for provinces with mortality rates above and then below the median. As shown in Table 6, the results from this analysis indicate that the overall patterns in the estimate of the impact of the FMP on age-specific mortality rates are similar between the two types of provinces. However, the estimates are larger and more precisely estimated for provinces with mortality rates above the median, as shown in Panel A. Not only are the program effects more acute for high-mortality provinces, they also set in more quickly. As shown by the estimates from the non-parametric specification in Panel A, the FMP effect becomes statistically significant in the second year following the introduction of the FMP for all four measures of mortality rates. Moreover, it sets in even quicker in the case of infant and elderly mortality where the estimate on the FMP indicator is negative and statistically significant in the first year after implementation. In contrast, the corresponding estimates for provinces with mortality rates below the median are smaller and do not become significant before either the third or fourth year after the introduction of the program for the all-age mortality rate and the mortality rates among infants and the elderly, and the fifth year for the mortality rate among children ages 1-4. One implication of the results presented in Table 6 is that mortality rates may be converging as a result of the FMP. This finding is consistent with Gruber et al. (2014), who showed reduced geographical disparities in infant mortality following the health reform in Thailand.

As stated earlier, a key innovation of the FMP is the assignment of every Turkish citizen to a specific family physician. We therefore estimate marginal productivity of each additional family physician in terms of lives saved. To this end, we regress mortality rates on the number of family physicians per province, along with other control variables specified in Eq. (1). One potential problem with this approach is that the actual number of physicians is likely to be endogenous to mortality and health outcomes. For example, according to the policy rules outlined by the PHIT, the target is to assign about 3500 citizens to every family physician. As shown in Appendix Table 1, this target appears to have been achieved in 2013. Specifically, there were 3493 citizens per family physician on average in 2013 strikingly close to the target rate. That being said, there is still considerable variation across provinces with the number of citizens served by a physician higher than the target figure of 3500 in many of the urban and developed provinces (e.g., Ankara, Antalya, Bursa, Istanbul, and Yalova) and considerably lower in some rural provinces (e.g., Bayburt, Bartin, Hakkari, Yozgat). This is not surprising since citizens typically have more options (e.g., public and private hospitals, polyclinics, doctors' offices) in urban areas compared to rural areas where options are more limited and distantly located. Furthermore, more doctors are needed to overcome access challenges in rural areas where many people live in sparsely populated settlement areas that are often distant from each other. That being said, some of the provinces in the Southwestern region of Turkey (e.g., Diyarbakir, Mardin, Sirnak, Siirt, Hakkari) appear to have fallen short of the target rate despite their rural locations. This is likely due, at least in part, to security concerns related to terrorism and civil unrest in those areas. In sum, the number of family physicians per capita is likely to be determined by a variety of factors, some of which are potentially endogenous to mortality.

To overcome these endogeneity concerns, we adopt a two-stage least squares regression approach in which the target rate for family physicians per capita is used as an instrumental variable (IV) for the actual number of doctors per capita. The advantage of this approach is that the measure for each province is only a function of the exogenously determined program rule. We then use the predicted number of physicians in the second-stage mortality regressions. The results from the first stage model in which we regress the actual number of doctors on the target number of doctors dictated FMP (population/3500 citizens) along with other variables in Eq. (1) are shown in Table 7A. The point estimate in Table 7A indicates that each additional 3500 citizens generates another 0.937 additional family physician, a figure very close to the target rate of one doctor per 3500 persons. Given the central role that family physicians play in the FMP, and the emphasis placed on achieving the specified target rate since the beginning, it is not surprising that the coefficient in the first stage is highly precisely estimated. The IV estimates are displayed in Table 7B. We present estimates for the marginal impact of a family physician on each of the three age-specific mortality rates in Panel A. All three estimates are negative and statistically significant ranging from 0.01 to 0.03%, indicating that an additional family physician lowers the mortality rate for each age category.

To put these estimates into further context, we next present results from an instrumental variables regression, in which we replaced the rates of mortality with the number of deaths for each age category in Panel B. The advantage of this specification is that it approximates the marginal product of an additional family physician in terms of number of lives saved. These estimates indicate that an additional family physician lowers the number of deaths among infants by 0.15, among the elderly by 0.46, and among children ages 1-4 by 0.005, respectively. Assuming a constant marginal product of physicians, a back of the envelope calculation obtained by multiplying these effect sizes with the total number of family physicians (21,384 in 2013) in Turkey reveals that the lives of 3101 infants, 9922 elderly citizens, and 107 children ages 1-4 saved by family physicians in 2013 alone.

Finally, we perform a similar analysis to investigate the role of family health centers in reducing mortality. Note that these centers serve as clinics for family physicians where they offer healthcare services to citizens on a walk-in-basis. To test whether an increase in the density of family health centers translates into reduced mortality rates, we gathered data on the annual number of family health centers for each province and constructed a density measure as defined by the number of centers per 100 $km^2$ (equivalent to about 38.6 $miles^2$). As shown in Table 8, the results from this analysis indicate that each family health center within a 100 $km^2$ lowers the rate of mortality by 3.7% among infants, 3.5% among children ages 1-4, and by 2.5% among the elderly. These results are informative in illustrating the importance of easily accessible and conveniently located services within local neighborhoods. However, similar to the assignment of the number of family physicians, the number of family health centers in a province is likely to be endogenously determined. Unlike the case for the number of family physicians, we do not have a policy rule that specifies a target level, which can then be leveraged to construct an exogenous measure. Therefore, we caution the reader against making causal inferences using these estimates.

*6.1. Robustness Analyses*

One way to gain further confidence in our results is to identify a set of outcomes for which the FMP should have no impact, and then conduct a placebo analysis using these outcomes. One set of potentially good candidates for this purpose is the outcomes related to injury and death rates associated with traffic accidents. To perform this analysis, we gathered data on province-specific annual rates of traffic accidents, accident deaths and injuries from TurkStat. Then we estimated our regressions for these outcome variables using our most comprehensive specification. The results from this placebo analysis are presented in Appendix Table 3. As shown in Panels A-C, regardless of how we define the treatment variable, the impact of the FMP on these three outcomes appear to be indistinguishable from zero with all estimates being statistically insignificant. The only exception is a coefficient on the year-two indicator in Panel C for traffic accident deaths. In Panels D and E of Appendix Table 3, we show placebo estimates for the models of the predicted number of family physicians and family health centers. As expected, neither family physicians nor family health centers appear to have any impact on traffic accidents, nor do they reduce injuries or deaths associated with these accidents. Taken together, the evidence presented in Appendix Table 3 lessens concerns over bias from potential endogeneity, and lends further support to the hypothesis that the FMP had a causal negative impact on age-specific mortality rates.

Next, we assess the sensitivity of our results to changes in reporting of the outcome values over time. If, for example, the FMP influences internal migration decisions, then the denominator in the outcome variables would be affected, which might in turn cause our estimates to be biased. To assess the sensitivity of our results to potential changes in the outcome variables due to factors correlated with the FMP, we estimated our models using the populations at the base period denominator and logarithms of the total number of deaths for the associated age category. The implications of our primary results remained identical to these robustness analyses. The estimates from the analysis using population at the baseline in the denominator are shown in Appendix Table 4.[31]

Recall that the end points in the pre- and post-implementation periods in our non-parametric specification are ≥5+ years and ≤-5 years. Accordingly, the number of observations for which these indicators take on the value of one varies by province since provinces implemented the FMP at different times during the analysis period. In our final robustness analysis, we estimate our models using a much more conservative sample defined by imposing the condition that every province has exactly five years of data prior to and following the FMP implementation by eliminating observations for any province beyond five years on either end. By doing this, we get a sense of whether our estimates are dominated by these observations at either end points of the analysis period. The results from this exercise are presented in Appendix Table 5. Although the coefficients are less precisely estimated due to significant reductions in sample size, the overall evidence points to a negative effect of the FMP on all four mortality outcomes, regardless

[31] In the interest of space, we do not show results from the analysis using the numerator values. These results are available from the authors upon request.

of the way the treatment measure is constructed. Furthermore, the estimates indicate that the program effect gets stronger over time, again a pattern consistent with our earlier results. Finally, in the bottom two panels of the table, we present estimates from the models for the marginal effect of a family physician and a family health center using a balanced sample. Again, despite a reduction in sample size, these estimates are still negative and statistically significant. The only exception is the estimate of the impact of FMP on mortality among children ages 1-4, for which the estimate is negative but imprecisely estimated. Note that in addition to the reduced sample size, the variation in the child mortality rate is quite low to begin with due to a very smaller number of deaths among this group.

**7. Conclusions**

Over the past decade, the Turkish healthcare system has undergone a major transformation marked by significant investments in infrastructure, education of healthcare personnel, modernization of patient tracking and payment systems, and most importantly, the launching of the Family Medicine Program (FMP). With the introduction of the FMP in 2005, Turkey has essentially established a socialized healthcare system for primary healthcare service under which every Turkish citizen is ensured a comprehensive package of healthcare services free-of-charge irrespective of the citizens' income or ability to pay. In addition to being a publicly funded program with universal coverage, the FMP contains a few other components that make it a particularly interesting and unique case to study. First and foremost, the key operational feature of the reform is the assignment of every Turkish citizen to a designated family physician who offers a wide range of healthcare services to the public in easily accessible neighborhood clinics.

Second, the program established a capitation plus performance-based compensation system designed to improve the quality of care.

This paper provides the first comprehensive analysis of the impact of the FMP on the outcomes of age-specific mortality rates using province level data between 2001 and 2014. To identify the causal effect of the FMP, we exploit the variation in program implementation across provinces and over time using a difference-in-differences estimation strategy. Our results indicate that the FMP has a significant negative impact on mortality rates for all age groups considered. According to our point estimates, the program reduces mortality by 11% among the all-age category, 25.6% among infants, 22.9% among children ages 1-4 and 7.7% among the elderly. These estimates translate into reductions in mortality by 2.6 infants per 1000, 1.29 elderly persons per 1000, and 0.13 children ages 1-4 per 1000. According to our analysis for the marginal productivity of a family physician, each physician saves 0.15 infants, 0.46 elderly persons and 0.005 children per province. Furthermore, the effect of the FMP appears to be strongest among provinces with a higher baseline mortality, suggesting that the program might also have contributed to an equalization of mortality across provinces over time.

Supply-side approaches aimed at achieving universal coverage, while ensuring affordability through public provision, and coupled with provider incentives to improve quality and control costs, are becoming of increasing interest to governments and international health organizations (United Nations Sustainable Development Solutions Network, 2014; WHO, 2014a). Evidence from several recent studies using credible research designs highlights the importance of some of these supply-side measures in improving public health, and reducing disparities in health outcomes in countries like

Brazil and Thailand. The current study builds upon this growing strand of literature by providing insights into the effectiveness of a supply-side intervention in Turkey where the entire population became entitled to free and easily accessible basic healthcare financed and delivered by the government. The findings in this paper serve as further compelling evidence in favor of the view that healthcare reforms employing strong supply-side instruments can generate significant health benefits by reducing mortality especially among infants and the elderly.

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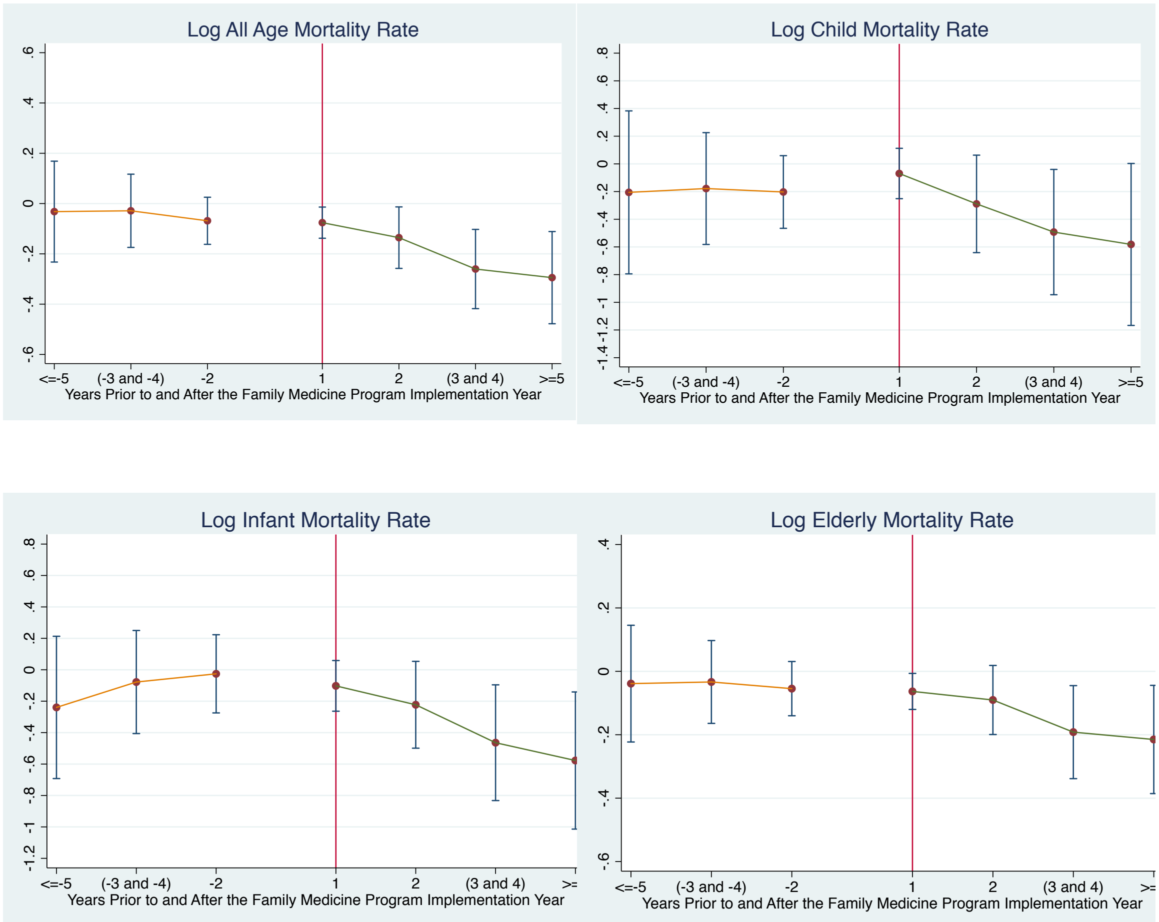
**Figure 1: Event Study Estimates of the Family Medicine Program on Mortality Rates**




Notes: The figures display the estimates and 95% confidence intervals. The reference category is "one year prior to the implementation of the FMP."

**Table 1. Summary Statistics by Family Medicine Program Implementation Status**

| | Full | FMP | Non-FMP |
|---|---|---|---|
| *Panel A: Mortality Rates* | | | |
| All Age Mortality (AMR) | 3.77 | 4.94 | 2.95 |
| | (1.68) | (1.38) | (1.36) |
| | [1134] | [493] | [641] |
| Infant Mortality (IMR) | 10.68 | 11.44 | 10.16 |
| | (5.23) | (3.32) | (6.15) |
| | [1122] | [491] | [631] |
| Child Mortality Rate (CMR) | 0.62 | 0.72 | 0.55 |
| | (0.43) | (0.45) | (0.41) |
| | [1080] | [486] | [594] |
| Elderly Mortality Rate (EMR) | 20.11 | 24.77 | 16.70 |
| | (7.16) | (3.95) | (7.06) |
| | [1134] | [493] | [641] |
| *Panel B: Time Varying Control Variables* | | | |
| Unemployment Rate | 10.89 | 10.40 | 11.44 |
| | (3.66) | (3.59) | (3.67) |
| | [891] | [398] | [493] |
| GDP Per Capita in Turkish Lira | 11063.92 | 13494.96 | 9775.16 |
| | (5011.23) | (5058.41) | (4484.65) |
| | [648] | [398] | [250] |
| Number of Vehicles Per 1000 persons | 181.58 | 221.35 | 153.67 |
| | (0.08) | (0.08) | (0.07) |
| | [1134] | [493] | [641] |
| Percent High School | 18.52 | 19.07 | 17.91 |
| | (4.52) | (4.76) | (4.16) |
| | [891] | [398] | [493] |
| Percent College | 9.41 | 10.94 | 7.72 |
| | (4.24) | (4.19) | (3.62) |
| | [891] | [398] | [493] |
| Students Per Teacher | 17.22 | 16.37 | 17.89 |
| | (3.78) | (3.37) | (3.95) |
| | [1035] | [560] | [493] |
| Percent Share of Governing Party Seats in the Parliament | 0.62 | 0.60 | 0.64 |
| | (0.17) | (0.17) | (0.17) |
| Observations | [1134] | [493] | [641] |

Notes: Standard deviations are in parenthesis. Number of observations is in brackets. In Panel A, mean values are weighted by the associated mean population for the relevant age group. In Panel B, mean values are weighted by province population.

**Table 2A: Estimates of Province and Region Level Time Varying Characteristics on Family Medicine Program Indicator**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| *Dependent Variable* | | | | | |
| Log Unemployment Rate | -0.128*** | 0.037 | -0.063 | -0.062 | -0.051 |
| | (0.038) | (0.060) | (0.067) | (0.069) | (0.059) |
| | [891] | [891] | [891] | [891] | [891] |
| Log Vehicles per 1000 persons | 0.441*** | 0.106 | -0.022 | -0.013 | -0.020 |
| | (0.043) | (0.080) | (0.023) | (0.019) | (0.016) |
| | [1134] | [1134] | [1134] | [1134] | [1134] |
| Log Per-capita GDP | 0.403*** | 0.086 | -0.003 | -0.002 | 0.001 |
| | (0.068) | (0.053) | (0.010) | (0.006) | (0.008) |
| | [648] | [648] | [648] | [648] | [648] |
| Log Percent High School | 0.049* | 0.120** | 0.004 | 0.000 | -0.010 |
| | (0.027) | (0.048) | (0.038) | (0.032) | (0.053) |
| | [891] | [891] | [891] | [891] | [891] |
| Log Percent College | 0.406*** | 0.194* | 0.060 | 0.054 | 0.031 |
| | (0.058) | (0.098) | (0.060) | (0.069) | (0.048) |
| | [891] | [891] | [891] | [891] | [891] |
| Log Students Per Teacher | -0.107*** | -0.109** | -0.017 | -0.012 | 0.007 |
| | (0.012) | (0.047) | (0.012) | (0.013) | (0.015) |
| | [1053] | [1053] | [1053] | [1053] | [1053] |
| Log Percent Share of Governing | -0.105** | -0.112 | -0.138 | -0.143 | -0.082 |
| Party Seats in Parliament | (0.045) | (0.147) | (0.101) | (0.113) | (0.164) |
| | [1134] | [1134] | [1134] | [1134] | [1134] |
| Controls for | | | | | |
| Region by Year Fixed Effects | No | Yes | Yes | Yes | Yes |
| Province Fixed Effects | No | No | Yes | Yes | Yes |
| Province Linear Trends | No | No | No | Yes | Yes |
| Province Quadratic Trends | No | No | No | No | Yes |

Notes: Each cell corresponds to a separate regression, where the "dependent variable" is regressed on *Family Medicine Program Indicator* conditional on control variables as indicated above. Models also control for a family medicine program year of adoption indicator. Regressions are weighted with mean province populations. Robust standard errors clustered at the province level are in parentheses. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

**Table 2B: Estimates of Province and Region Level Time Varying Characteristics on Years since the Family Medicine Program Implementation**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| *Dependent Variable* | | | | | |
| Log Unemployment Rate | -0.031*** | 0.020 | -0.015 | -0.022 | -0.017 |
| | (0.011) | (0.029) | (0.022) | (0.038) | (0.028) |
| | [891] | [891] | [891] | [891] | [891] |
| Log Per-capita Vehicles | 0.095*** | 0.034 | -0.006 | -0.008 | -0.010 |
| | (0.009) | (0.023) | (0.016) | (0.011) | (0.011) |
| | [1134] | [1134] | [1134] | [1134] | [1134] |
| Log Per-capita GDP | 0.124*** | 0.026 | -0.005 | -0.007 | -0.004 |
| | (0.024) | (0.016) | (0.005) | (0.005) | (0.006) |
| | [648] | [648] | [648] | [648] | [648] |
| Log Percent High School | 0.018*** | 0.038** | 0.014 | -0.002 | -0.007 |
| | (0.006) | (0.016) | (0.015) | (0.021) | (0.017) |
| | [891] | [891] | [891] | [891] | [891] |
| Log Percent College | 0.087*** | 0.047* | 0.003 | 0.014 | -0.005 |
| | (0.012) | (0.024) | (0.017) | (0.040) | (0.043) |
| | [891] | [891] | [891] | [891] | [891] |
| Log Students Per Teacher | -0.030*** | -0.035*** | -0.014*** | 0.005 | 0.014 |
| | (0.003) | (0.012) | (0.005) | (0.008) | (0.010) |
| | [1053] | [1053] | [1053] | [1053] | [1053] |
| Log Percent Share of Governing Party Seats in Parliament | -0.021** | 0.002 | 0.009 | -0.034 | -0.034 |
| | (0.010) | (0.047) | (0.025) | (0.091) | (0.102) |
| | [1134] | [1134] | [1134] | [1134] | [1134] |
| Controls for | | | | | |
| Region by Year Fixed Effects | No | Yes | Yes | Yes | Yes |
| Province Fixed Effects | No | No | Yes | Yes | Yes |
| Province Linear Trends | No | No | No | Yes | Yes |
| Province Quadratic Trends | No | No | No | No | Yes |

Notes: Each cell corresponds to a separate regression, where the "dependent variable" is regressed on *Years Since Family Medicine Program Implementation* conditional on control variables as indicated above. Regressions are weighted with mean province populations. Standard errors clustered at the province level are in parentheses. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively.

**Table 3. The Impact of the Family Medicine Program on Mortality Rates**

| | (1) AMR | (2) IMR | (3) CMR | (4) EMR |
|---|---|---|---|---|
| *Panel A. Controls for Province Fixed Effects and Region-by-year Fixed Effects* | | | | |
| FMP post-Implementation Year Indicator | -0.154*** | -0.309*** | -0.308*** | -0.108*** |
| | (0.045) | (0.104) | (0.098) | (0.038) |
| FMP Year of Implementation Indicator | 0.012 | 0.047 | 0.149 | 0.002 |
| | (0.045) | (0.084) | (0.095) | (0.040) |
| *Panel B: Controls for Panel A + Province-Specific Linear Trends* | | | | |
| FMP post-Implementation Year Indicator | -0.075** | -0.164** | -0.149* | -0.046* |
| | (0.032) | (0.074) | (0.085) | (0.027) |
| FMP Year of Implementation Indicator | 0.021 | 0.039 | 0.153* | 0.011 |
| | (0.039) | (0.082) | (0.090) | (0.035) |
| *Panel C: Controls for Panel B + Province-Specific Quadratic Trends* | | | | |
| FMP post-Implementation Year Indicator | -0.124*** | -0.314** | -0.286** | -0.089** |
| | (0.045) | (0.128) | (0.120) | (0.040) |
| FMP Year of Implementation Indicator | -0.006 | -0.049 | 0.072 | -0.012 |
| | (0.035) | (0.066) | (0.079) | (0.031) |
| *Panel D: Controls for Panel C + Time Varying Province Characteristics* | | | | |
| FMP post-Implementation Year Indicator | -0.112** | -0.296** | -0.260** | -0.080* |
| | (0.048) | (0.125) | (0.121) | (0.042) |
| FMP Year of Implementation Indicator | -0.001 | -0.043 | 0.087 | -0.008 |
| | (0.036) | (0.068) | (0.080) | (0.033) |
| Observations | 1134 | 1122 | 1080 | 1134 |

Notes: Regressions are weighted with mean province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. Time varying province characteristics include log of unemployment rate, log of vehicles per 1000 persons, log of per capita GDP, log of percent high school, log of percent college, log of students per teacher in primary schools. AMR: All age mortality rate. IMR: Infant mortality rate. CMR: Mortality rate among children ages 1-4. EMR: Elderly mortality rate. All dependent variables are expressed in natural logarithm.

**Table 4. The Impact of the Family Medicine Program on Mortality Rates Allowing for a Dynamics Relationship**

| Variable | (1) AMR | (2) IMR | (3) CMR | (4) EMR |
|---|---|---|---|---|
| *Panel A. Estimates of Mortality on Year Since FMP Implementation* | | | | |
| Years Since FMP Implemented | -0.103** | -0.271** | -0.286*** | -0.080* |
| | (0.049) | (0.114) | (0.106) | (0.045) |
| *Panel B. Estimates of Mortality on Binary Years Since FMP Implementation Indicators* | | | | |
| FMP Year 1 | -0.050** | -0.176*** | -0.027 | -0.048** |
| | (0.024) | (0.066) | (0.072) | (0.023) |
| FMP Year 2 | -0.116** | -0.336** | -0.297** | -0.083* |
| | (0.052) | (0.141) | (0.135) | (0.045) |
| FMP Year 3 & 4 | -0.246** | -0.638*** | -0.551** | -0.193** |
| | (0.096) | (0.230) | (0.224) | (0.088) |
| FMP Year >=5 | -0.284** | -0.799*** | -0.684** | -0.224* |
| | (0.130) | (0.296) | (0.300) | (0.119) |
| Observations | 1134 | 1122 | 1080 | 1134 |

Notes: Regressions are weighted with mean province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. All models control for province fixed effects, region-by-year fixed effects, province level linear and quadratic trends, and time varying province characteristics, which include log of unemployment rate, log of vehicles per 1000 persons, log of per capita GDP, log of percent high school, log of percent college, log of students per teacher in primary schools. AMR: All age mortality rate. IMR: Infant mortality rate. CMR: Mortality rate among children ages 1-4. EMR: Elderly mortality rate. All dependent variables are expressed in natural logarithm.

**Table 5. Estimates from the Event–Study Analysis for Mortality Rates**

| Variable | (1) AMR | (2) AMR | (3) IMR | (4) IMR | (5) CMR | (6) CMR | (7) EMR | (8) EMR |
|---|---|---|---|---|---|---|---|---|
| FMP Year <=-5 | | -0.032 | | -0.240 | | -0.206 | | -0.039 |
| | | (0.101) | | (0.227) | | (0.296) | | (0.092) |
| FMP Year -3 & -4 | | -0.029 | | -0.078 | | -0.178 | | -0.034 |
| | | (0.073) | | (0.165) | | (0.203) | | (0.066) |
| FMP Year -2 | | -0.069 | | -0.026 | | -0.203 | | -0.055 |
| | | (0.047) | | (0.125) | | (0.132) | | (0.043) |
| FMP Year 1 | -0.050** | -0.076** | -0.176*** | -0.103 | -0.027 | -0.069 | -0.048** | -0.063** |
| | (0.024) | (0.031) | (0.066) | (0.081) | (0.072) | (0.091) | (0.023) | (0.029) |
| FMP Year 2 | -0.116** | -0.136** | -0.336** | -0.223 | -0.297** | -0.289 | -0.083* | -0.090 |
| | (0.052) | (0.061) | (0.141) | (0.139) | (0.135) | (0.177) | (0.045) | (0.055) |
| FMP Year 3 & 4 | -0.246** | -0.260*** | -0.638*** | -0.464** | -0.551** | -0.493** | -0.193** | -0.192** |
| | (0.096) | (0.079) | (0.230) | (0.185) | (0.224) | (0.227) | (0.088) | (0.074) |
| FMP Year >=5 | -0.284** | -0.295*** | -0.799*** | -0.577** | -0.684** | -0.582* | -0.224* | -0.215** |
| | (0.130) | (0.092) | (0.296) | (0.219) | (0.300) | (0.294) | (0.119) | (0.086) |
| Observations | 1134 | 1134 | 1122 | 1122 | 1080 | 1080 | 1134 | 1134 |

Notes: Regressions are weighted with mean province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. All models control for province fixed effects, region-by-year fixed effects, province level linear and quadratic trends, and time varying province characteristics, which include log of unemployment rate, log of vehicles per 1000 persons, log of per capita GDP, log of percent high school, log of percent college, log of students per teacher in primary schools. AMR: All age mortality rate. IMR: Infant mortality rate. CMR: Mortality rate among children ages 1-4. EMR: Elderly mortality rate. All dependent variables are expressed in natural logarithm.

**Table 6. The Impact of the Family Medicine Program on Mortality Rates Separately Baseline Mortality**

| Variable | (1)<br>AMR | (2)<br>IMR | (3)<br>CMR | (4)<br>EMR |
|---|---|---|---|---|
| *Panel A: The impact of FMP on Mortality Rates in Provinces with Above Median Mortality Rates* | | | | |
| FMP post-Implementation Year Indicator | -0.159*** | -0.390*** | -0.337** | -0.130*** |
| | (0.043) | (0.114) | (0.137) | (0.040) |
| FMP Year of Implementation Indicator | 0.022 | -0.062 | 0.042 | 0.021 |
| | (0.045) | (0.094) | (0.145) | (0.040) |
| FMP Year 1 | -0.058 | -0.222** | -0.104 | -0.053* |
| | (0.034) | (0.094) | (0.117) | (0.031) |
| FMP Year 2 | -0.196*** | -0.481*** | -0.432*** | -0.164*** |
| | (0.053) | (0.124) | (0.151) | (0.050) |
| FMP Year >=3 & <=4 | -0.367*** | -0.808*** | -0.714*** | -0.322*** |
| | (0.094) | (0.202) | (0.223) | (0.088) |
| FMP Year >=5 | -0.477*** | -1.067*** | -0.959*** | -0.417*** |
| | (0.125) | (0.246) | (0.333) | (0.119) |
| Observations | 560 | 557 | 547 | 560 |
| *Panel B: The impact of FMP on Mortality Rates in Provinces with Below Median Mortality Rates* | | | | |
| FMP post-Implementation Year Indicator | -0.105 | -0.225 | -0.131 | -0.074 |
| | (0.087) | (0.228) | (0.183) | (0.082) |
| FMP Year of Implementation Indicator | 0.044 | 0.105 | 0.310** | 0.023 |
| | (0.054) | (0.128) | (0.135) | (0.046) |
| FMP Year 1 | -0.032 | -0.094 | 0.133 | -0.031 |
| | (0.038) | (0.126) | (0.115) | (0.036) |
| FMP Year 2 | -0.141 | -0.297 | -0.225 | -0.109 |
| | (0.097) | (0.264) | (0.208) | (0.087) |
| FMP Year >=3 & <=4 | -0.285** | -0.680* | -0.519 | -0.212* |
| | (0.140) | (0.386) | (0.324) | (0.119) |
| FMP Year >=5 | -0.389** | -0.914* | -0.778* | -0.303* |
| | (0.183) | (0.498) | (0.433) | (0.155) |
| Observations | 574 | 565 | 533 | 574 |

Notes: Regressions are weighted with mean province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. Time varying province characteristics include log of unemployment rate, log of vehicles per 1000 persons, log of per capita GDP, log of percent high school, log of percent college, log of students per teacher in primary schools. AMR: All age mortality rate. IMR: Infant mortality rate CMR: Mortality rate among children ages 1-4. EMR: Elderly mortality rate. All dependent variables are expressed in natural logarithm.

**Table 7A. The Impact of Predicted Family Physicians on Family Physicians (First Stage Estimates)**

| Variable | (1)<br># of Family Physicians |
|---|---|
| Predicted # of Family Physicians | 0.937*** |
| | (0.004) |
| | |
| Observations | 1134 |

Note: See the notes in Table 7B.

**Table 7B. Marginal Product of a Family Physician (Instrumental Variable Estimates)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Panel A: The IV Estimates of the Impact of an Additional Family Physician on Mortality Rates | | | | |
| | AMR | IMR | CMR | EMR |
| # of Family Physicians | -0.0002*** | -0.0003*** | -0.0003*** | -0.0001*** |
| | (0.0000) | (0.0001) | (0.0001) | (0.0000) |
| Panel B: The IV Estimates of the Impact of an Additional Family Physician on # of Deaths | | | | |
| | Total Deaths | Infant Deaths | Child Deaths | Elderly Deaths |
| # of Family Physicians | -1.273*** | -0.145*** | -0.005** | -0.464*** |
| | (0.126) | (0.007) | (0.003) | (0.098) |
| *First Stage F-test* | *62178* | *41509* | *42001* | *72553* |
| *First State F-test P-value* | *0.00* | *0.00* | *0.00* | *0.00* |
| Observations | 1134 | 1122 | 1080 | 1134 |

Notes: Regressions are weighted with mean province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. All models control for province fixed effects, region-by-year fixed effects, province level linear and quadratic trends, and time varying province characteristics, which include log of unemployment rate, log of vehicles per 1000 persons, log of per capita GDP, log of percent high school, log of percent college, log of students per teacher in primary schools. AMR: All age mortality rate. IMR: Infant mortality rate. CMR: Mortality rate among children ages 1-4. EMR: Elderly mortality rate. In Table 7B, all dependent variables are expressed in natural logarithm.

**Table 8. The Impact of Family Health Center Density on Mortality Rates**

| Variable | (1)<br>AMR | (2)<br>IMR | (3)<br>CMR | (4)<br>EMR |
|---|---|---|---|---|
| Family Health Center Density | -0.026*** | -0.037*** | -0.035*** | -0.025*** |
| | (0.003) | (0.009) | (0.010) | (0.003) |
| Observations | 1134 | 1122 | 1080 | 1134 |

Notes: Regressions are weighted with mean province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. All models control for province fixed effects, region-by-year fixed effects, province level linear and quadratic trends, and time varying province characteristics, which include log of unemployment rate, log of vehicles per 1000 persons, log of per capita GDP, log of percent high school, log of percent college, log of students per teacher in primary schools. Family Health Center Density is defined as the number of Family Health Centers per 100-kilometer square. AMR: All age mortality rate. IMR: Infant mortality rate. CMR: Mortality rate among children ages 1-4. EMR: Elderly mortality rate. All the dependent variables are expressed in natural logarithm.

**Appendix Table 1. Family Medicine Program Implementation Year and Population Per Family Physician in 2013**

| Provinces by Region | Year of Implementation | Population Per Family Physician | Provinces by Region | Year of Implementation | Population Per Family Physician |
|---|---|---|---|---|---|
| *Aegean Region* | | | *Mediterranean Region* | | |
| Afyonkarahisar | 2010 | 3448 | Adana | 2008 | 3534 |
| Aydin | 2010 | 3534 | Antalya | 2010 | 3745 |
| Denizli | 2006 | 3497 | Burdur | 2008 | 3215 |
| Izmir | 2007 | 3571 | Hatay | 2010 | 3690 |
| Kutahya | 2010 | 3236 | Isparta | 2007 | 3215 |
| Manisa | 2008 | 3401 | Kahramanmaras | 2010 | 3472 |
| Mugla | 2010 | 3521 | Mersin | 2010 | 3497 |
| Usak | 2009 | 3205 | Osmaniye | 2008 | 3436 |
| *Central Anatolia Region* | | | *Northeast Anatolia Region* | | |
| Aksaray | 2010 | 3484 | Agri | 2010 | 3717 |
| Kayseri | 2008 | 3436 | Ardahan | 2010 | 3311 |
| Kirikkale | 2008 | 3236 | Bayburt | 2008 | 2907 |
| Kirsehir | 2008 | 3021 | Erzincan | 2010 | 3145 |
| Nevsehir | 2010 | 3322 | Erzurum | 2008 | 3205 |
| Nigde | 2010 | 3367 | Igdir | 2010 | 3521 |
| Sivas | 2010 | 3521 | Kars | 2010 | 3497 |
| Yozgat | 2010 | 3311 | *Southeast Anatolia Region* | | |
| *Central East Anatolia* | | | Adiyaman | 2006 | 3623 |
| Bingol | 2010 | 3356 | Batman | 2010 | 3584 |
| Bitlis | 2010 | 3704 | Diyarbakir | 2010 | 3788 |
| Elazig | 2007 | 3289 | Gaziantep | 2010 | 3759 |
| Hakkari | 2010 | 4274 | Kilis | 2010 | 3571 |
| Malatya | 2010 | 3356 | Mardin | 2010 | 3937 |
| Mus | 2010 | 3690 | Sanliurfa | 2010 | 3623 |
| Tunceli | 2008 | 3413 | Siirt | 2010 | 3690 |
| Van | 2010 | 3788 | Sirnak | 2010 | 3623 |
| *East Black Sea Region* | | | *West Anatolia Region* | | |
| Artvin | 2010 | 3322 | Ankara | 2010 | 3802 |
| Giresun | 2010 | 3484 | Karaman | 2008 | 3135 |
| Gumushane | 2006 | 3367 | Konya | 2010 | 3584 |
| Ordu | 2010 | 3731 | *West Black Sea Region* | | |
| Rize | 2009 | 3460 | Amasya | 2007 | 3185 |
| Trabzon | 2009 | 3257 | Bartin | 2007 | 3155 |
| *East Marmara Region* | | | Cankiri | 2008 | 3891 |
| Bilecik | 2008 | 3311 | Corum | 2008 | 3145 |
| Bolu | 2006 | 3257 | Karabuk | 2008 | 3390 |
| Bursa | 2009 | 3636 | Kastamonu | 2008 | 3534 |
| Duzce | 2005 | 3623 | Samsun | 2007 | 3497 |
| Eskisehir | 2006 | 3571 | Sinop | 2007 | 3521 |
| Kocaeli | 2010 | 3584 | Tokat | 2010 | 3436 |
| Sakarya | 2010 | 3559 | Zonguldak | 2010 | 3472 |
| Yalova | 2008 | 4000 | *West Marmara & Istanbul* | | |
| | | | Balikesir | 2010 | 3546 |
| | | | Canakkale | 2010 | 3717 |
| | | | Edirne | 2006 | 3460 |
| | | | Istanbul | 2010 | 3891 |
| | | | Kirklareli | 2010 | 3546 |
| | | | Tekirdag | 2010 | 3623 |

Note: Information on the FMP is obtained from the Public Health Institution of Turkey.

**Appendix Table 2A. Event-Study Estimates for Overall Mortality Rate**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| FMP Year <=-5 | | -0.067 | -0.128 | -0.032 |
| | | (0.111) | (0.083) | (0.101) |
| FMP Year -3 & -4 | | -0.043 | -0.089 | -0.029 |
| | | (0.066) | (0.061) | (0.073) |
| FMP Year -2 | | -0.078* | -0.094** | -0.069 |
| | | (0.044) | (0.044) | (0.047) |
| FMP Year 1 | -0.042 | -0.071** | -0.048** | -0.076** |
| | (0.030) | (0.029) | (0.023) | (0.031) |
| FMP Year 2 | -0.126** | -0.146*** | -0.082** | -0.136** |
| | (0.050) | (0.053) | (0.040) | (0.061) |
| FMP Year 3 & 4 | -0.302*** | -0.315*** | -0.172*** | -0.260*** |
| | (0.095) | (0.083) | (0.052) | (0.079) |
| FMP Year >=5 | -0.463*** | -0.466*** | -0.180*** | -0.295*** |
| | (0.167) | (0.135) | (0.067) | (0.092) |
| Observations | 1134 | 1134 | 1134 | 1134 |
| Controls for | | | | |
| Region by Year Fixed Effects | Yes | Yes | Yes | Yes |
| Province Fixed Effects | Yes | Yes | Yes | Yes |
| Time Varying Province Characteristics | Yes | Yes | Yes | Yes |
| Province Linear Trends | No | No | Yes | Yes |
| Province Quadratic Trends | No | No | No | Yes |

Notes: Regressions are weighted with mean province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. Time varying province characteristics include log of unemployment rate, log of vehicles per 1000 persons, log of per capita GDP, log of percent high school, log of percent college, log of students per teacher in primary schools. Dependent variable is expressed in natural logarithm.

**Appendix Table 2B. Event-Study Estimates for Infant Mortality Rate**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| FMP Year <=-5 | | -0.436** | -0.473** | -0.240 |
| | | (0.209) | (0.211) | (0.227) |
| FMP Year -3 & -4 | | -0.162 | -0.225 | -0.078 |
| | | (0.137) | (0.149) | (0.165) |
| FMP Year -2 | | -0.056 | -0.086 | -0.026 |
| | | (0.113) | (0.121) | (0.125) |
| FMP Year 1 | -0.122* | -0.082 | -0.035 | -0.103 |
| | (0.065) | (0.075) | (0.071) | (0.081) |
| FMP Year 2 | -0.303*** | -0.214* | -0.100 | -0.223 |
| | (0.107) | (0.120) | (0.095) | (0.139) |
| FMP Year 3 & 4 | -0.676*** | -0.515*** | -0.262** | -0.464** |
| | (0.197) | (0.183) | (0.117) | (0.185) |
| FMP Year >=5 | -1.155*** | -0.874*** | -0.325** | -0.577** |
| | (0.326) | (0.276) | (0.140) | (0.219) |
| Observations | 1122 | 1122 | 1122 | 1122 |
| Controls for | | | | |
| Region by Year Fixed Effects | Yes | Yes | Yes | Yes |
| Province Fixed Effects | Yes | Yes | Yes | Yes |
| Time Varying Province Characteristics | Yes | Yes | Yes | Yes |
| Province Linear Trends | No | No | Yes | Yes |
| Province Quadratic Trends | No | No | No | Yes |

Notes: Regressions are weighted with mean province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. Time varying province characteristics include log of unemployment rate, log of vehicles per 1000 persons, log of per capita GDP, log of percent high school, log of percent college, log of students per teacher in primary schools. Dependent variable is expressed in natural logarithm.

**Appendix Table 2C. Event-Study Estimates for Child Mortality Rate**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| FMP Year <=-5 | | -0.375 | -0.404 | -0.206 |
| | | (0.245) | (0.247) | (0.296) |
| FMP Year -3 & -4 | | -0.233 | -0.287* | -0.178 |
| | | (0.159) | (0.168) | (0.203) |
| FMP Year -2 | | -0.227* | -0.245** | -0.203 |
| | | (0.119) | (0.122) | (0.132) |
| FMP Year 1 | 0.000 | -0.076 | -0.015 | -0.069 |
| | (0.073) | (0.078) | (0.068) | (0.091) |
| FMP Year 2 | -0.294*** | -0.318*** | -0.192* | -0.289 |
| | (0.108) | (0.117) | (0.105) | (0.177) |
| FMP Year 3 & 4 | -0.636*** | -0.613*** | -0.334*** | -0.493** |
| | (0.156) | (0.136) | (0.084) | (0.227) |
| FMP Year >=5 | -1.065*** | -0.964*** | -0.388*** | -0.582* |
| | (0.264) | (0.209) | (0.110) | (0.294) |
| Observations | 1080 | 1080 | 1080 | 1080 |
| Controls for | | | | |
| Region by Year Fixed Effects | Yes | Yes | Yes | Yes |
| Province Fixed Effects | Yes | Yes | Yes | Yes |
| Time Varying Province Characteristics | Yes | Yes | Yes | Yes |
| Province Linear Trends | No | No | Yes | Yes |
| Province Quadratic Trends | No | No | No | Yes |

Notes: Regressions are weighted with mean province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. Time varying province characteristics include log of unemployment rate, log of vehicles per 1000 persons, log of per capita GDP, log of percent high school, log of percent college, log of students per teacher in primary schools. Dependent variable is expressed in natural logarithm.

**Appendix Table 2D. Event-Study Estimates for Elderly Mortality Rate**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| FMP Year <=-5 | | -0.049 | -0.110 | -0.039 |
| | | (0.105) | (0.075) | (0.092) |
| FMP Year -3 & -4 | | -0.038 | -0.079 | -0.034 |
| | | (0.060) | (0.054) | (0.066) |
| FMP Year -2 | | -0.062 | -0.074* | -0.055 |
| | | (0.040) | (0.040) | (0.043) |
| FMP Year 1 | -0.029 | -0.054** | -0.042* | -0.063** |
| | (0.025) | (0.025) | (0.022) | (0.029) |
| FMP Year 2 | -0.072* | -0.092* | -0.048 | -0.090 |
| | (0.043) | (0.046) | (0.036) | (0.055) |
| FMP Year 3 & 4 | -0.208** | -0.222*** | -0.123** | -0.192** |
| | (0.087) | (0.074) | (0.049) | (0.074) |
| FMP Year >=5 | -0.311** | -0.318*** | -0.121* | -0.215** |
| | (0.152) | (0.117) | (0.064) | (0.086) |
| Observations | 1134 | 1134 | 1134 | 1134 |
| Controls for | | | | |
| Region by Year Fixed Effects | Yes | Yes | Yes | Yes |
| Province Fixed Effects | Yes | Yes | Yes | Yes |
| Time Varying Province Characteristics | Yes | Yes | Yes | Yes |
| Province Linear Trends | No | No | Yes | Yes |
| Province Quadratic Trends | No | No | No | Yes |

Notes: Regressions are weighted with mean province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. Time varying province characteristics include log of unemployment rate, log of vehicles per 1000 persons, log of per capita GDP, log of percent high school, log of percent college, log of students per teacher in primary schools. Dependent variable is expressed in natural logarithm.

**Appendix Table 3: The Impact of Family Medicine Program on Traffic Accidents, Traffic Accident Deaths, and Traffic Accident Injuries**

| Variables | (1) Log Traffic Accident Rate | (2) Log Traffic Accident Death Rate | (3) Log Traffic Accident Injury Rate |
|---|---|---|---|
| *Panel A: Binary FMP Indicator* | | | |
| FMP post-Implementation Year Indicator | -0.026 | -0.077 | -0.013 |
| | (0.021) | (0.060) | (0.020) |
| FMP Year of Implementation Indicator | -0.021 | -0.036 | -0.011 |
| | (0.013) | (0.051) | (0.013) |
| *Panel B: Years Since FMP Implementation* | | | |
| Years Since FMP Implemented | -0.007 | -0.041 | -0.005 |
| | (0.014) | (0.041) | (0.014) |
| *Panel C: Binary Years Since FMP Implementation Indicators* | | | |
| FMP Year 1 | -0.020 | -0.051 | -0.012 |
| | (0.015) | (0.055) | (0.015) |
| FMP Year 2 | -0.017 | -0.116* | -0.005 |
| | (0.022) | (0.061) | (0.022) |
| FMP Year >=3 & <=4 | -0.028 | -0.099 | -0.020 |
| | (0.034) | (0.094) | (0.033) |
| FMP Year >=5 | -0.010 | -0.190 | -0.004 |
| | (0.043) | (0.117) | (0.044) |
| *Panel D: Predicted # of Family Physicians* | | | |
| # of Family Physicians | 0.000001 | -0.000037 | 0.0000003 |
| | (0.000006) | (0.000026) | (0.0000072) |
| *First Stage F-test* | *62178* | *62178* | *62178* |
| *First State F-test P-value* | *0.00* | *0.00* | *0.00* |
| *Panel E: Family Health Center Density* | | | |
| Family Health Center Density | 0.0011 | -0.0106 | 0.0016 |
| | (0.0012) | (0.0065) | (0.0013) |
| Observations | 1134 | 1134 | 1134 |

Notes: Regressions are weighted with mean province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. All models control for province fixed effects, region-by-year fixed effects, province level linear and quadratic trends, and time varying province characteristics, which include log of unemployment rate, log of vehicles per 1000 persons, log of per capita GDP, log of percent high school, log of percent college, log of students per teacher in primary schools. Dependent variables are expressed in natural logarithm.

**Appendix Table 4: The Impact of Family Medicine Program on Mortality Rates Using Baseline Population Values to Calculate the Mortality Rates**

| Variables | (1) AMR | (2) IMR | (3) CMR | (4) EMR |
|---|---|---|---|---|
| *Panel A: Binary FMP Indicator* | | | | |
| FMP post-Implementation Year Indicator | -0.114** | -0.301** | -0.246** | -0.079* |
| | (0.048) | (0.132) | (0.118) | (0.043) |
| FMP Year of Implementation Indicator | -0.004 | -0.032 | 0.091 | -0.011 |
| | (0.036) | (0.074) | (0.079) | (0.034) |
| *Panel B: Years Since FMP Implementation* | | | | |
| Years Since FMP Implemented | -0.104** | -0.285** | -0.278*** | -0.077* |
| | (0.048) | (0.115) | (0.099) | (0.044) |
| *Panel C: Binary Years Since FMP Implementation Indicators* | | | | |
| FMP Year 1 | -0.053** | -0.174** | -0.020 | -0.049** |
| | (0.024) | (0.071) | (0.072) | (0.024) |
| FMP Year 2 | -0.120** | -0.343** | -0.283** | -0.082* |
| | (0.052) | (0.147) | (0.133) | (0.046) |
| FMP Year >=3 & <=4 | -0.247** | -0.664*** | -0.528** | -0.187** |
| | (0.094) | (0.233) | (0.211) | (0.087) |
| FMP Year >=5 | -0.288** | -0.834*** | -0.660** | -0.216* |
| | (0.126) | (0.297) | (0.284) | (0.117) |
| *Panel D: Predicted # of Family Physicians* | | | | |
| # of Family Physicians | -0.0002*** | -0.0003*** | -0.0003*** | -0.0001*** |
| | (0.0000) | (0.0001) | (0.0001) | (0.0000) |
| *First Stage F-test* | *55264* | *36081* | *36340* | *65543* |
| *First State F-test P-value* | *0.00* | *0.00* | *0.00* | *0.00* |
| *Panel E: Family Health Center Density* | | | | |
| Family Health Center Density | -0.026*** | -0.042*** | -0.033*** | -0.0250*** |
| | (0.0045 | (0.010) | (0.009) | (0.003) |
| Observations | 1134 | 1122 | 1080 | 1134 |

Notes: Regressions are weighted with baseline province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. All models control for province fixed effects, region-by-year fixed effects, province level linear and quadratic trends, and time varying province characteristics, which include log of unemployment rate, log of vehicles per 1000 persons, log of per capita GDP, log of percent high school, log of percent of college, log of students per teacher in primary schools. AMR: All age mortality rate. IMR: Infant mortality rate. CMR: Mortality rate among children ages 1-4. EMR: Elderly mortality rate.

**Appendix Table 5: The Impact of Family Medicine Program on Mortality**
**Balanced Sample (-5 years to +5 years)**

| Variables | (1)<br>AMR | (2)<br>IMR | (3)<br>CMR | (4)<br>EMR |
|---|---|---|---|---|
| *Panel A: Binary FMP Indicator* | | | | |
| FMP post-Implementation Year Indicator | -0.089** | -0.194* | -0.197* | -0.063 |
| | (0.042) | (0.104) | (0.113) | (0.038) |
| FMP Year of Implementation Indicator | -0.000 | -0.047 | 0.082 | -0.009 |
| | (0.028) | (0.065) | (0.069) | (0.026) |
| *Panel B: Years Since FMP Implementation* | | | | |
| Years Since FMP Implemented | -0.138*** | -0.188 | -0.307*** | -0.106** |
| | (0.047) | (0.125) | (0.099) | (0.042) |
| *Panel C: Binary Years Since FMP Implementation Indicators* | | | | |
| FMP Year 1 | -0.039 | -0.066 | 0.025 | -0.041* |
| | (0.023) | (0.061) | (0.071) | (0.023) |
| FMP Year 2 | -0.108** | -0.159 | -0.220 | -0.079* |
| | (0.051) | (0.126) | (0.138) | (0.045) |
| FMP Year >=3 & <=4 | -0.250*** | -0.283 | -0.425* | -0.201** |
| | (0.090) | (0.195) | (0.225) | (0.082) |
| FMP Year =5 | -0.268** | -0.188 | -0.443 | -0.217* |
| | (0.124) | (0.280) | (0.353) | (0.111) |
| *Panel D: Predicted # of Family Physicians* | | | | |
| # of Family Physicians | -0.0001*** | -0.0001*** | -0.0001 | -0.0001*** |
| | (0.0000) | (0.0000) | (0.0001) | (0.0000) |
| *First Stage F-test* | 67414 | 44015 | 41991 | 78397 |
| *First State F-test P-value* | 0.00 | 0.00 | 0.00 | 0.00 |
| *Panel E: Family Health Center Density* | | | | |
| Family Health Center Density | -0.014*** | -0.027*** | -0.012 | -0.015*** |
| | (0.002) | (0.008) | (0.012) | (0.002) |
| Observations | 809 | 799 | 765 | 809 |

Notes: Regressions are weighted with mean province populations for the associated age group. *, **, and *** indicate statistical significance at 10%, 5% and 1%, respectively. AMR: All age mortality rate. IMR: Infant mortality rate. CMR: Mortality rate among children ages 1-4. EMR: Elderly mortality rate. All dependent variables are expressed in natural logarithm.