Emerging and Encouraging Trends in E-Prescribing Adoption Among Providers and Pharmacies

Meghan H. Gabriel, PhD; Michael F. Furukawa, PhD; and Varun Vaidya, PhD

Objective: The objective of this study is to describe the growth in provider (physician, nurse practitioner, and physician assistant) adoption of e-prescribing and the growth in pharmacies actively accepting e-prescriptions using nationally representative data from December 2008 to December 2012. Additionally, this study explored e-prescribing adoption variation by urban and rural counties.

Study Design: Descriptive analysis of nationally representative, transactional e-prescribing data.

Methods: Data for this analysis were from Surescripts. Surescripts is a leading e-prescription network utilized by a majority of all chain, franchise, or independently owned pharmacies in the United States routing prescriptions for more than 240 million patients through their network.

Results: The total number of prescribers, including physicians, nurse practitioners, and physician assistants e-prescribing via an electronic health record (EHR) on the Surescripts network has increased from 7% to 54%. Additionally, the number of pharmacies actively accepting e-prescriptions is 94%. These increases in pharmacies actively accepting e-prescriptions and the provider's e-prescribing mirror the increase in the volume of e-prescriptions sent on the Surescripts network.

Conclusions: This analysis shows that the vast majority of pharmacies in the United States are able to accept e-prescriptions and over half of providers are e-prescribing via an EHR.

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For author information and disclosures, see end of text.

Electronic prescribing (e-prescribing) is the electronic transmittal of a prescription to a pharmacy from the provider and is a tool used to send accurate, error-free, and legible prescriptions to pharmacies.[1,2] Providers can e-prescribe via electronic health records (EHRs) or standalone e-prescribing systems. EHRs have advantages such as clinical notes, laboratory results and orders, and a broad range of clinical decision support that standalone systems do not offer.[3] E-prescribing through EHRs improves the availability of pharmacy benefits information and patient medication histories, making potentially life-saving information available immediately.[2]

Evidence of the benefits of e-prescribing is mounting. E-prescribing has been found to significantly reduce prescription errors in community-based ambulatory practices and eliminate prescription errors due to illegibility.[4,5] In 2000, the Institute of Medicine (IOM) detailed the rate of preventable medication errors associated with paper prescribing practices.[3] In addition, the IOM called for the transformation of healthcare through the use of health information technology (Health IT) such as e-prescribing in "Crossing the Quality Chasm."[6]

E-prescribing has been encouraged by the Federal government for nearly 10 years. The first time was when the Medicare Modernization Act (MMA) was passed in 2003.[1] Federal regulations passed in 2006 and all states enacted laws to allow the electronic exchange of most types of prescriptions,[7] thereby eliminating legal barriers to the adoption of e-prescribing. The Medicare Improvements for Patients and Providers Act of 2008 (MIPPA) authorized e-prescribing incentive payments for Medicare providers, starting in 2009.[8] Most recently, The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 was passed.[9]

The goal of the HITECH act was to help meet the objectives of the "triple aim": to improve care, improve population health overall, and reduce the costs of healthcare.[10] To help spur health information technology (IT) adoption, "meaningful use" incentive payments were designed to help with the initial costs of EHRs for eligible providers. These payments are designed to encourage and facilitate the adoption of health IT including e-prescribing. Additionally, the State Health Information Exchange Cooperative Agreement Program (State HIE Program) in the Office

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of the National Coordinator for Health Information Technology (ONC) awarded grants to 56 states and eligible territories.[11] This program specifically focuses on pharmacy adoption of e-prescribing, and encourages grantees to employ various strategies to advance pharmacy e-prescribing. ONC has also funded 62 regional extension centers (RECs) to help more than 100,000 primary care providers from individual and small practice settings adopt and use EHRs.[12] Despite the potential benefits of implementing e-prescribing, due to the technical, cost, and/or regulatory barriers, studies have indicated that the adoption of e-prescribing has been slow.[13] Additionally, studies have held that technical challenges such as availability of reliable high-speed network connections to operate e-prescribing systems especially in the rural areas may affect preparedness of the pharmacies to accept e-prescribing.[14] Therefore, federal, state, and local governments have devoted significant efforts to the adoption of e-prescribing.

The objective of this study is to describe the growth in provider (physician, nurse practitioner, and physician assistant) adoption of e-prescribing and the growth in pharmacies actively accepting e-prescriptions using nationally representative data.

Take-Away Points

Electronic prescribing among pharmacies and providers (including nurse practitioners, physician assistants, and physicians) has increased.

- Providers e-prescribing via an electronic health record has increased from 7% in December 2008 to 54% in December 2012.
- Pharmacies actively e-prescribing has increased from 70% in December 2008 to 94% in December 2012.
- No significant differences currently exist among provider or pharmacy adoption in rural and urban areas.

METHODS

Data

Surescripts is a leading e-prescription network utilized by a majority of all chain, franchise, or independently owned pharmacies in the United States routing prescriptions for more than 240 million patients through their network, excluding closed systems such as Kaiser Permanente.[15] For national results, data from all 50 states and the District of Columbia were included in the analysis. The data represent transactions from December 2008 to December 2012. The area resource file was used to determine county level urban and rural characteristics.[16]

Surescripts pharmacy data include all pharmacies registered with the National Council for Prescription Drug Programs (NCPDP). The NCPDP files include indicators of whether each pharmacy is connected to the Surescripts network and whether each pharmacy processed a prescription on the Surescripts network in the given month. In this analysis, an active pharmacy is a pharmacy that has processed at least 1 electronic prescription in the given month. To support a realistic denominator of pharmacies that have the ability to e-prescribe on the Surescripts network, this analysis included chain, franchise, and independent pharmacies. Medical device manufacturers, nuclear, intravenous infusion, and government/military pharmacies were excluded.

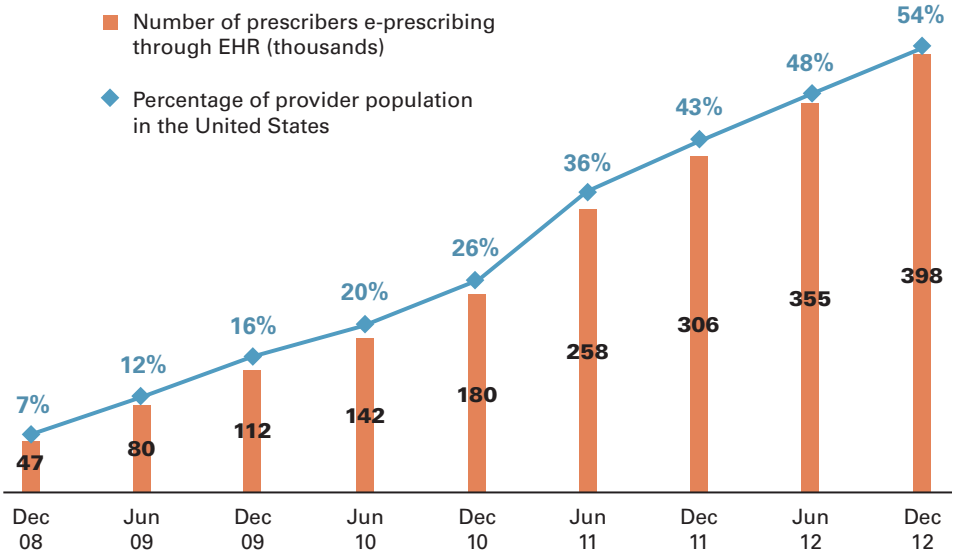
For providers, including physicians, nurse practitioners, and physician assistants, Surescripts data provide an e-prescribing method. For penetration rates of providers e-prescribing via an EHR, a method of identifying provider denominators was developed with SK&A, a proprietary data set using a combination of the title and specialty variables.[17] The database is designed to comprise a census of ambulatory healthcare sites with at least 1 provider with prescribing authority. All sites are contacted twice a year and asked to confirm information on practice location, the providers who work at the site, and other site characteristics. The counts were de-duplicated to correct for individual providers who are observed at multiple sites. Data for annual percentages of new and renewal prescriptions routed through the Surescripts network data exclude controlled substances.

RESULTS

The total number of prescribers, including physicians, nurse practitioners, and physician assistants e-prescribing via EHR on the Surescripts network has increased, as displayed in **Figure 1**. In December 2008 the total number of prescribers using an EHR on the Surescripts network was approximately 47,000, representing 7% of the provider population in the United States. As of December 2012, the total number increased to 398,000, representing 54% of providers in the United States. Among current prescribers on the Surescripts network, 86% use an EHR while 14% use standalone e-prescribing systems (data not shown).

In order for providers to successfully use their e-prescribing systems, they must have pharmacies with the ability to accept these e-prescriptions. The growth in pharmacies actively e-prescribing in the United States during this study period is displayed in **Figure 2**. The percent of retail pharmacies actively e-prescribing on the Surescripts network increased from 43,000 pharmacies, representing 70% of all chain, franchise, and independent pharmacies in December 2008 to over

Figure 1. Growth in Prescribers Electronically Prescribing (E-prescribing) Through an Electronic Health Record



EHR indicates electronic health record.
Denominators for prescribers derived from SK&A and range from 668,395 to 733,499 in 2012.

59,000 pharmacies, representing 94%, in December 2012, therefore showing a 24% increase in the past 4 years.

These increases in pharmacies actively accepting e-prescriptions and in providers' e-prescribing mirror the increase in the volume of e-prescriptions sent on the Surescripts network. In 2008, 4% of all new and renewal prescriptions were sent electronically in the United States. It is forecasted that 45% of new and renewal prescriptions will be sent electronically in 2012. In December 2008, 61% of pharmacies in rural counties were actively accepting e-prescriptions, compared with 75% of urban pharmacies (P <.001). This 14% gap has closed during the study period. In December 2012, 94% of urban pharmacies and 93% of rural pharmacies were actively accepting e-prescriptions. For providers, adoption has remained consistent between urban and rural providers (data shown in **eAppendix**; available at **www.ajmc.com**). Additional results regarding new and renewal prescriptions and variations in e-prescribing among pharmacies and providers in rural and urban counties are also given in the eAppendix.

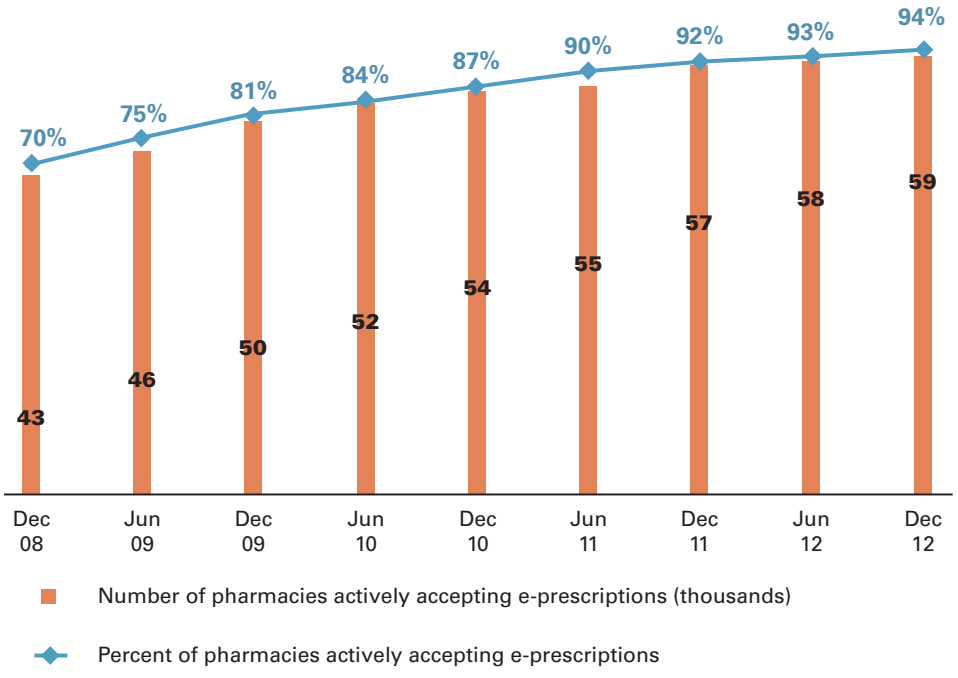
DISCUSSION

The majority of pharmacies in the United States have been able to accept e-prescriptions since 2008. This suggests that e-prescribing among physicians was not hindered by the lack of pharmacies able to receive e-prescriptions. In order to implement health information technologies, providers need to be able to afford the technologies, have access to those technologies in the marketplace, be able to implement the technology in practice, and perceive that the technologies are worthwhile.[18] The HITECH act and resulting programs such as the State HIE and REC have assisted with the first 3 points. However, provider perceptions are less influenced by governmental policies and programs than by their practice experience. The large increase in e-prescribers (7%-54%) suggests accumulating positive perceptions as experience grows. Over half of providers have implemented EHRs and e-prescribe via those systems. This is consistent with current literature.[19]

Cost and work flow concerns are most commonly cited as the primary challenges to health IT adoption.[18] Studies have noted that e-prescribing has doubled prescribing time for office-based physicians. This time is partially offset by reducing other record-keeping tasks.[20] The IOM reported that although ubiquitous in other major industries, the diffusion of relevant technologies in healthcare is still in its very early stages. The report states that EHRs have the potential to improve patient outcomes and also improve adherence to medications.[21] Federal incentives, meaningful use requirements, and the federal programs detailed above may have helped lead toward increased positive experience, and thus driven this remarkable increase in adoption of e-prescribing.

E-prescribing is an essential component of meaningful use, an important milestone for health information exchange (HIE), and is important to meeting the triple aim.[10] Tracking the distribution of new prescriptions and renewal requests on the Surescripts network is a useful way to assess the robustness

Figure 2. Growth in Pharmacies Actively E-Prescribing



An active pharmacy indicates a pharmacy that has processed at least 1 electronic prescription in the given month.

of HIE, as renewal requests require bidirectional exchange between pharmacist and prescriber. Additionally, patient adherence to medications is better with e-prescribing.[22] A recent review article found that 92% of health IT studies during that time showed either positive or mixed positive outcomes.[23] Complete EHR use may add additional quality and outcome benefits. Payers and prescribers are enabled to communicate information that will lead to improved quality care for patients. Formulary benefit alerts, safety alerts, adherence reminders, and gaps in care alerts are some of the initial innovations that HIE via EHRs makes possible.

In addition to the challenges faced by urban providers, rural providers and pharmacies face unique issues with access, resources, and connection. With this in mind, the RECs have worked with over 50% of eligible providers in rural areas to provide assistance regarding e-prescribing and other requirements of meaningful use. Additionally, the State HIE Program has reached out to rural pharmacies to help facilitate e-prescribing. Our study found no current major differences in provider adoption by rurality. This is in agreement with 2 early studies of physician offices which showed that Health IT adoption and use in rural offices was not lower than in urban offices.[24,25]

Despite the progress made in the use of e-prescribing, there is also a concern of lack of ability to receive and process e-prescriptions by independent or rural pharmacies for reasons such as availability of broadband Internet and concern over transaction fees. Studies have suggested that incentive programs or grants to help with infrastructure would help to overcome that issue.[26] It is important to note that our study reports no difference in ability of pharmacies in rural and urban counties which are actively e-prescribing. This indicates the potential success of incentives, grants, and technical assistance provided to such pharmacies.

With the increase of health IT use among providers and pharmacies, concerns have been raised regarding patient privacy and increased third-party access to health information. It is of note that in the period of this study, those issues do not appear to impede rapid growth in utilization and adoption. However, questions regarding the cost and health benefits of health information technologies such as e-prescribing and EHR use continue to be voiced. This analysis suggests that increasing experience with various HIE technologies such as e-prescribing results in their rapid growth. This is a trend encouraging continued exploration of the clinical and economic benefits of HIE.

Limitations

Data used for this analysis were generated from prescribers and pharmacies connected to the Surescripts Network and e-prescribing transactions that flow through the network. Due to the strength of market share, Surescripts can serve as

a proxy for national trends analysis. While Surescripts captures the vast majority of outpatient transactions, it may not include transactions from a number of sources such as inpatient e-prescribing where the prescription goes directly to the hospital pharmacy, e-prescribing that occurs within a closed integrated delivery network (eg, Kaiser Permanente), and transactions that occur solely on competing networks.

CONCLUSIONS

E-prescribing is proving its potential to create a gateway to the improved patient care that health IT promises. The majority of pharmacies in the United States are able to accept e-prescriptions and nearly half of providers are e-prescribing via an EHR. These percentages have increased significantly as pharmacy and prescribing practitioner experience have grown. This study shows positive emerging trends in electronic prescribing by demonstrating accelerated growth in adoption of electronic prescribing at both provider and pharmacy level. Continuous efforts and focused investments can be expected to diminish most of the barriers to implementation in the future.

Author Affiliations: From Office of the National Coordinator for Health IT (MHG, MFF), Washington, DC; College of Pharmacy (VV), University of Toledo, Toledo, OH.

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Address correspondence to: Meghan H. Gabriel, PhD, Office of the National Coordinator for Health Information Technology, US Department of Health and Human Services, 200 Independence Ave, S.W. Washington, DC 20201. E-mail: Meghan.Gabriel@hhs.gov.

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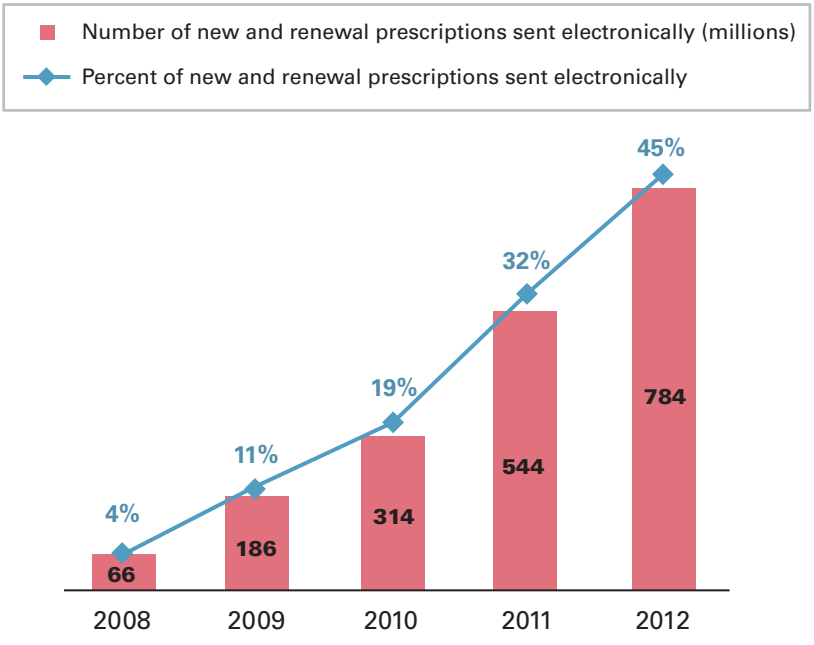
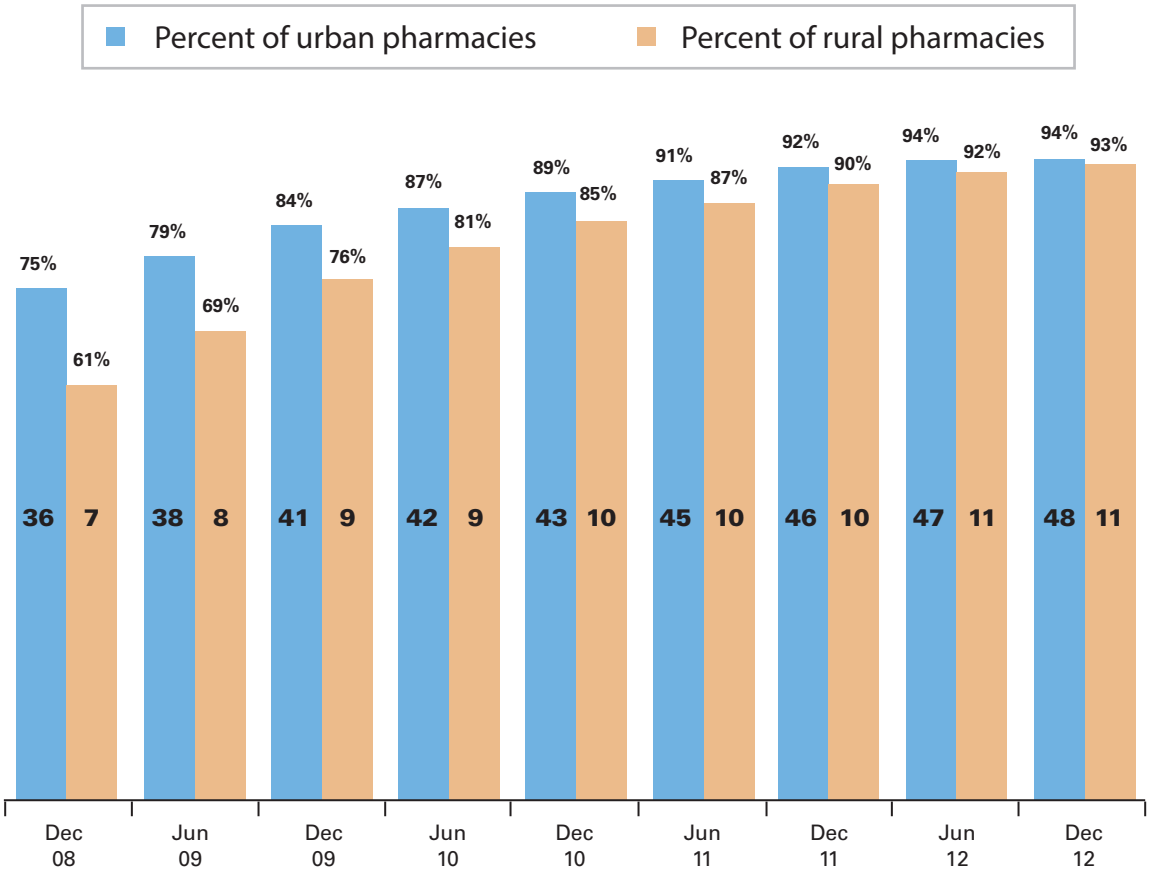
eAppendix A. Annual Growth in New and Renewal Prescriptions Sent Electronically



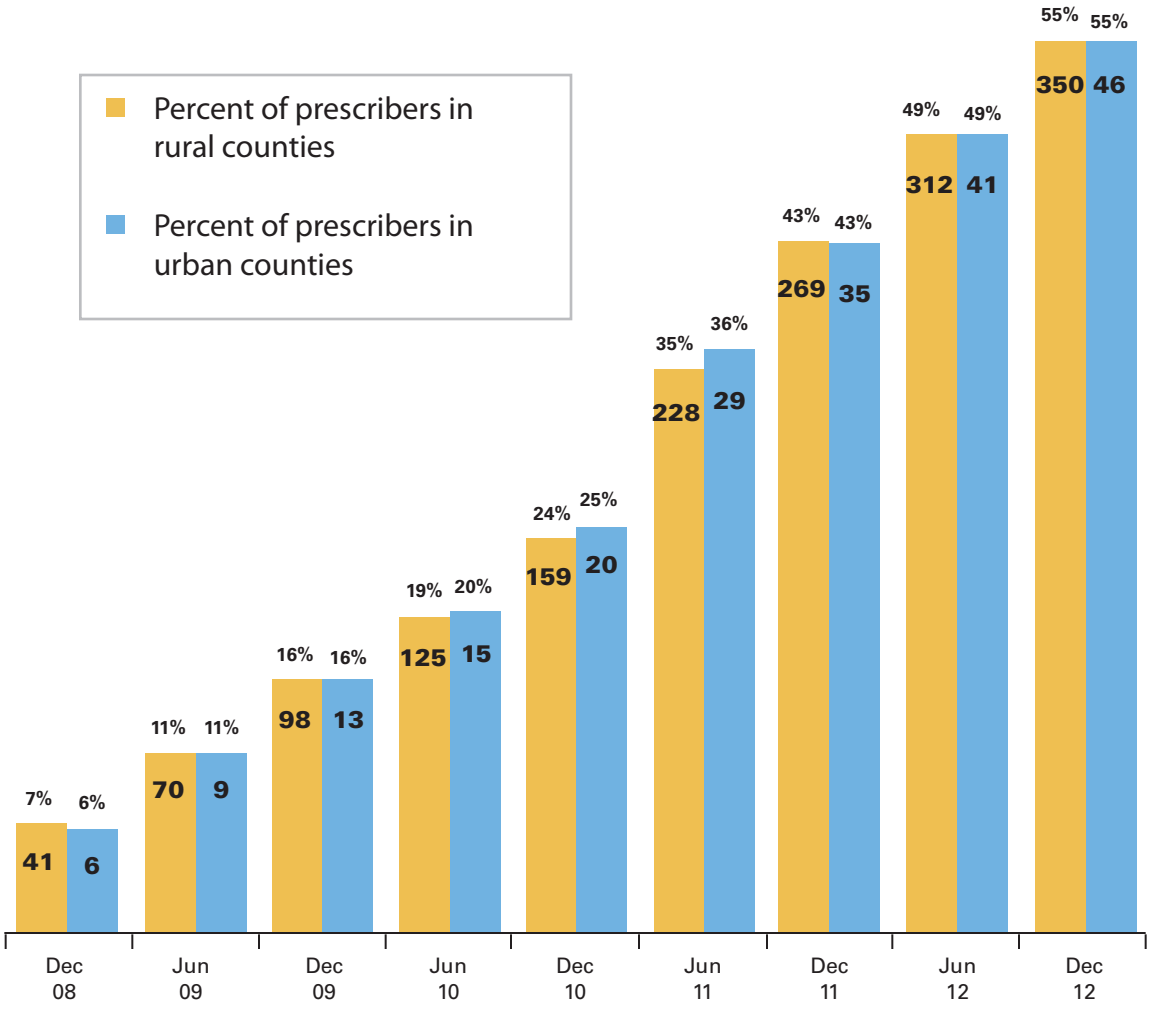
New prescription indicates a new prescription routed from prescriber to pharmacies; renewal prescription, a renewal response that is routed between prescribers and pharmacies.
These increases in pharmacies actively accepting e-prescriptions and in providers' e-prescribing mirror the increase in the volume of e-prescriptions sent on the Surescripts network. The annual increase is displayed above. In 2008, over 66 million new and renewal prescriptions were sent electronically, representing 4% of all new and renewal prescriptions sent in the United States, both electronically and via paper. In 2011, this number was 544 million, representing 32% of all new and renewal prescriptions. It is forecasted that the annual number of new and renewal e-prescriptions in 2012 will be 784 million, representing 45% of all new and renewal prescriptions in the United States. This shows a projected 13% increase in all new and renewal prescriptions sent electronically from 2011 to 2012.

eAppendix B. Growth in Urban and Rural Pharmacies Actively Accepting E-Prescriptions



Numbers in bars represent the number of pharmacies (thousands).
E-prescribing trends in pharmacy and providers in urban and rural counties are displayed in Appendices B and C. In December 2008, 61% of pharmacies in rural counties were actively accepting e-prescriptions, compared with 75% of urban pharmacies (P <.001). This 14% gap closed during the study period. As of December 2012, 93% of rural pharmacies are actively accepting e-prescriptions compared with 94% of urban pharmacies, with no significant differences in proportions (P =.1524). For providers, adoption has remained consistent between urban and rural providers. In December 2008, the percentages of urban and rural providers e-prescribing via electronic health record (EHR) were 6% and 7%, respectively (P = -.9087). As of December 2012, 55% of rural and 55% of urban providers were e-prescribing via EHR.

eAppendix C. Growth in Rural and Urban Providers E-Prescribing via an Electronic Health Record



Numbers in bars represent the number of e-prescribers (thousands).