D TECHNOLOGY CONSIDERATIONS

D.1 INTRODUCTION

The purpose of this Appendix is to describe a number of technological advances that offer the potential to improve service delivery to WIC participants, staff, and management. The feasibility of each technology area is discussed, including pros and cons, for consideration in future designs of WIC systems. It is hoped that this Appendix will familiarize WIC staff with potential applications of this technology and help them to evaluate whether they could use this technology in their specific environments to achieve efficiencies, reduce costs, and improve participant service. A secondary purpose of this document is to serve as a guide to companies engaged in the various technologies as to how a potential market area views the technology. It is important to note that the information in this document is subject to change as technology changes.

The order of presentation (alphabetical) of these technologies has absolutely no implication as to preference, simplicity/difficulty, or applicability. These discourses are at an overview level only and should not be interpreted as providing adequate information to support the actual implementation of any of these technologies.

For each technology, the following sections are included:

- **Definition** – A presentation of terminology relevant to the technology under consideration.
- **Description** – A brief overview of the technology and how it functions.
- **Pros** – Potential advantages and reasons to consider the adoption of the technology.
- **Cons** – Potential disadvantages, problems to be overcome, or barriers that must be faced in implementing the technology.
- **State Suggested WIC Uses** – State and local agency suggested ways to employ the technology within the WIC Program.

The intent of this Appendix is to present the issues one needs to consider when examining these technologies for relevance in a given program's WIC

environment. Because the WIC environment varies significantly from program to program, the applicability of a given technology is highly situational. Further, the actual implementations of the emerging technologies described in this section may be vastly different across WIC programs, depending upon the needs and environments of each State. What is a very desirable or even "necessary" technology in one program may be undesirable in another. More importantly, the programs may view the technologies and their implementations from differing perspectives. The reasons that might argue for a technology in one situation may well be viewed as arguments against that technology in another environment.

While this document presents some perceived advantages and disadvantages, as well as suggested uses for each technology, the authors realize that the appraisal of the technology may vary substantially depending upon the viewpoint of the evaluator. FNS understands that a single solution that will work the same way for the same reasons in all situations is unrealistic. Therefore, this Appendix merely strives to introduce key issues, as well as to convey selected interviewees' perceptions of the desirability or challenges posed by the technology. It is clearly up to the individual reader to determine whether the suggested "Pros" or "Cons" apply to an individual State's situation.

D.2 TECHNOLOGY AREAS

D.2.1 AUDIO RESPONSE UNIT/AUTO DIALER

Definition:

Audio Response Unit – An automated telephone answering system that provides voice answers to questions using data from the WIC system. For example, it can be used to remind participants of appointments, respond to participant inquiries, and record problem inquiries. The technology is easily adaptable to multi-language use.

Auto Dialer – An automated telephone system that automatically dials numbers from a file and provides a recorded message to the participant who answers the phone.

Description:

In some cases, the Audio Response Unit (ARU) might use voice recognition technology to communicate with the user. More often, it issues prompting messages and then accepts touch-tone button input in response. In either approach, the primary use is to guide the user through a menu system to obtain the information the user desires. That information could be fairly constant data like the address of or directions to a WIC office, or it could be more volatile data like a participant's next appointment schedule. It can also be used to record voice or tone input from the user. The ARU is often used in conjunction with a customer service center to provide customer support for WIC systems. In the customer service/help desk area, the ARU can be used to route calls to the appropriate customer service representative, or to manage call queues.

The Auto Dialer can receive downloaded files, which it uses to identify calls to be made. Auto Dialers can be used to provide appointment reminders to participants, provide general messages to participants (such as in the move of a facility), or to appraise vendors of their application status.

In spite of some weaknesses and limitations, the ARU is a very effective and useful technology in many areas, including many WIC-related areas. The key points to a successful implementation include:

- Keep access menus and the actual data presented as simple as possible.
- If at all possible, move the presentation into the users native language before doing anything else ("For English, press 1, Pour francais, frappe 2, Para español…). If this is done first, then anyone who gets into the wrong language can simply hang up and retry the call, rather than losing time.
- Run extensive Usability Testing and use the results to modify the application. Focus on quickness, ease, and simplicity. Avoid wide-scope and extensive functionality. Be sure it works well and simply. Ensure that it never offends or frustrates the users. ABSOLUTELY ensure against "dead ends" in the menus. DO NOT waste the user's time.
- People are so ready to be frustrated by this technology that they do NOT give it second chances. Conversely, they are so pleasantly surprised by a friendly and useful implementation that they will have their friends call in just for fun.

- When selecting products to implement this technology, use products that implement database interfaces through industry standard means (such as ANSI SQL).

Pros:

The ARU provides the opportunity to reduce staff time devoted to answering routine questions and redirect that time to nutrition counseling and enhanced customer service. When used in conjunction with a Customer Service Unit, the ARU allows the efficient management of call loading so that customers are served more quickly and effectively.

Similarly, Auto Dialers have the potential to save staff time and improve customer service. This technology encourages frequent reminders because it is efficient and cost effective. Staff time that was used to make calls can now be redirected to improved customer service and enhancing the efficiency of clinic operations.

Cons:

There are a number of drawbacks. For any beyond the simplest of menus, it is difficult, at best, to create a useful and easily understood dialog with the user. This problem is exacerbated by the current existence of so many poorly designed audio response systems. This has made many people reluctant to use these systems. Even minor problems tend to infuriate users who are already frustrated from previous bad experiences. In addition, it is generally very difficult or even impossible to provide a reasonable and useful presentation of anything beyond very simple and straightforward data. Although significant improvements are being made, the current voice synthesis technology (for converting data into voice messages) tends to produce either very disjointed, jerky sentences, or produce language that seems heavily accented and is difficult for many people to understand. This is especially true when the presentation (any part of it) is not in the user's native language.

State Suggested WIC Uses:

- **Distribute Applicant Information** – Potential WIC participants can obtain basic WIC information such as clinic hours and location, required eligibility documents, and available services. The applicants can gain

basic knowledge about the WIC program, in whatever language they desire, without using staff time for routine requests.

- **Verify Upcoming Appointments** – The ARU allows participants to call in and quickly check on their scheduled appointments and change them if necessary.

- **Remind Participants of Appointments** – The Auto Dialer provides a quick way to remind participants of their upcoming appointments.

- **Manage Help Desk Call Load** – The ARU can be used to quickly route calls to the appropriate Customer Service Representative (CSR). In an EBT/ESD environment, the system can triage participant, program, vendor, and provider staff to ensure that their call is routed to the CSR most able to provide necessary assistance. It can also help balance the call load among CSRs, so that calls are handled as quickly as possible.

D.2.2 BAR CODES

Definition:

Bar Code – A series of vertical lines of varying widths, or other more complex encoding patterns that enable fast, automated identification of or explanation about an item such as food instruments, vouchers, participants, and foods. It can also be used for publications and materials.

Description:

This is not a new technology. However, the type, complexity, security, and data density of bar coding encryption patterns has increased significantly in the last few years. The ease of use, speed, and cost of equipment for handling such codes have also improved dramatically. There is a widespread and commonly used infrastructure that supports common use of this form of data encoding and exchange. While its use within WIC is still largely limited to identification numbers on ID cards and UPCs on foods, there is the potential for WIC systems to take advantage of the increasing potential of this technology.

Pros:

Demographic, benefit/VOC, "medical alert" and other detailed information is easily encoded into very small physical areas of identity cards. This can be combined with or handled entirely separately from any magnetic encoding that might also be used. In general, this approach is less expensive and provides

most, sometimes all, of the benefits of the more complex magnetic or "memory" types of data storage. If standard formats are defined, the information is easily and inexpensively shared among the various WIC programs as participants move between them.

Another useful example involves security. Many states are now incorporating a "bar code" style encoding of fingerprints. These are printed on identity cards such as driver's licenses and can then be used in the increasingly cost-efficient fingerprint identification technology now becoming available (See also the "Biometrics" section of this document). Again, with defined standards to which the various WIC programs could subscribe, this technology could prove useful not only within a given program, but also between programs as participants are transferred from one location to another.

Cons:

Although bar code technology is relatively inexpensive to implement, it does require an infrastructure. Bar code readers must be installed in multiple locations in order for it to be effective. Not all clinics currently have such an infrastructure and installation could be costly. Additionally, multi-technology cards (i.e., cards with more than one technology such as magnetic stripe and bar code) are generally more expensive than single technology cards or paper cards. While the bar code does allow the encoding of limited amounts of information, it does not provide the extended data storage or processing capability of the integrated circuit chip card.

State Suggested WIC Uses:

- **Serialized Inventory** – WIC clinics often have a need to keep track of serialized items such as food instruments, cards, or breast pumps. Bar codes provide an inexpensive way to automate inventory management.
- **Non-serialized Inventory** – WIC clinics often have a need to keep track of nutrition education publications, vendor publications, or other materials. Bar codes provide an inexpensive way to automate inventory management.
- **Exchange of Benefit/VOC Information** – The bar code provides an inexpensive mechanism to share limited amounts of data between WIC local agencies, other State agencies, and other health care providers.

- **Biometric Information** – The bar code provides an inexpensive way to implement the use of certain types of biometrics (such as a fingerprint) to ensure that the food benefits are redeemed by the legitimate cardholder or the designated proxy.

D.2.3 BIOMETRICS

Definition:

Biometric – An automated identification process for identity verification of individuals based on unique behavioral or physiological characteristics. These are unique things that we do or unique physical characteristics that we have. Behavioral biometrics includes voice, signature, and keyboard typing technique. Physical biometrics includes fingerprint, hand geometry, facial recognition, and iris/retinal scans.

Description*:*

Nearly everything that makes humans unique is being studied as a means of confirming identification. Their applicability to the WIC program pertains to the identification of staff and participants to insure appropriate access and authorization of computer and/or human-based functions primarily associated with the certification process, issuance of food and food instruments, and the "purchase" of food.

Biometrics are methods of measuring the inherent physical attributes of an individual. This measurement is usually performed to identify an individual or to verify a claimed identity. Biometrics can be used in two ways: identification and verification. Identification compares a live biometric scan against a database of biometric templates to identify a given individual. Verification entails matching a live biometric scan against a single template carried on a smart card (or barcode) to verify the individual's identity. Verification (matching one to one) typically requires a more simplistic algorithm and performs better than identification (matching one to many).

Fingerprint readers will become commonplace in the general computer market place in the next few years. A number of companies already provide such devices. The usability and cost-effectiveness of the devices is improving rapidly.

In addition to fingerprint readers, there are several other biometric devices either currently in the market or in the advance research phases. We can expect to see the economic feasibility of these devices for WIC programs in the next 5-10 years. The following sections describe some biometrics currently in use.

D.2.3.1 Fingerprints

Use of a fingerprint requires that the user place one or more fingers on a platen on the fingerprint scanner. Scanners use different technologies to capture fingerprints and convert them to templates to use for verification comparisons. One method analyzes the position of minutiae, which are the end points and junctions of ridges. Yet another method regards the fingerprint image as a pattern; the whorls, loops and tilts are digitized to make a visual comparison with the offered print.

Fingerprint readers are small and relatively low cost with entry-level products in the $70-200 range per device. They can have problems reading worn or dirty fingers and most of the current devices have a rather limited ability to differentiate between similar patterns. Currently, the most practical use is probably as a quick "screening" tool rather than as a confirmation tool. For example, a fingerprint scanner could provide a quick identity check at Food Instrument issuance (However, digitized signatures could be used as a screening tool at food instrument issuance. See the section below on electronic signatures). If there were an indication of lack of match, the issuing staff should follow up by checking other types of ID such as driver's licenses. The low-cost devices are probably not ready for use as an "absolute" determinate of identity. Too many harmful errors could occur in such an environment. In addition, there are possible legal/liability problems if devices of less-than-certain accuracy are used to exclude people from benefits. In addition, some people find them intrusive with the fear that a national database could be established and used for all kinds of undesirable purposes. Naturally, they do require that the individual has at least one finger or toe with a visible 'print' remaining.

D.2.3.2 Facial Recognition

Facial recognition is based upon comparison of the characteristics of a live scan of a face against a stored template of facial characteristics. Various technologies may be used to perform facial recognition. Some products utilize off-the-shelf video/digital cameras. Such products employ algorithms to create a set of numbers related to the face rather than the facial image itself. One method uses spatial measurement, recording such distances as the center of the eye to the bottom of the ear, to the tip of the chin, and to the high cheek feature. Another method uses two cameras to record a stereo view of the face. This method evaluates the entire face, not just key features. Other products use infrared technology.

Facial readers are in use today in some ATMs and are not considered to be intrusive. They cannot differentiate between identical twins and can have problems identifying people with certain skin characteristics, particularly dark and/or non-reflective skin. While this technology will likely improve over time, there are problems with it now and it does not seem to provide any advantages over other methods beyond its less intrusive nature. At this point, the apparent limitations of the technology make its usefulness for WIC questionable.

D.2.3.3 Iris/Retinal Scan

The iris of the eye is a mathematically unique feature of the human body. Each iris is composed of a unique visible structure, which features a complex combination of corona, pits, filaments, crypts, striations, radial furrows, etc. It is this structure and pattern that is imaged and encoded in the iris template. The iris has limited genetic penetrance, which ensures that even identical twins have iris patterns as distinct in their mathematical detail as those of unrelated persons. To capture an iris scan, a video/digital camera takes a picture that locates the eye and iris. The boundaries of the pupil and limbus are defined, eyelid occlusion and specular refection are discounted and the quality of image focus is determined for processing. The iris pattern is processed and encoded into a template that is stored on a smart card. It is then compared against the live iris scan image obtained by having the user merely look into a reader. Retinal scanners work on

similar principals, but require that the user be positioned in a specific way, which is more intrusive than the iris scan.

Iris/retinal scanners are in use today in some ATMs. They are highly accurate but tend to be more costly than other current forms of biometric identification. They may not work if the iris or retina is occluded by factors such as cataracts or injury to the cornea. They will not work where there is significant damage to the eye structure regardless of the 'sight' condition of the individual. If costs come down without reductions in accuracy, these devices may prove useful in the future.

D.2.3.4 Hand Geometry

Hand geometry systems use optical systems to map key geometrical features of the topography of a hand to verify an individual's identity. Hand geometry technology uses a number of different measurements to create the template. These readings may include measuring finger length, skin translucency, hand thickness, and palm shape. Live scans of the hand are compared against the template to verify a person's identity.

Hand geometry readers can be used for access identification. While they appear reliable, they are bulky and somewhat difficult to use.

D.2.3.5 Voice Recognition

Voice verification is possible because every person has a unique set of voice characteristics and speech patterns. Voice verification extracts specific and unique features from a person's speech, such as pitch, tone, cadence, harmonic level and vibrations in the larynx and stores and uses them to differentiate that person's voice from other voices. All voice recognition systems require speech samples from each user to associate with the user's profile or account. A person using a voice verification system begins by claiming to be an enrolled user. This is generally accomplished by speaking or otherwise inputting an identification code. The spoken input is compared with a stored sample of the enrolled user's speech. This stored sample is called a voice print. If the two samples, voice print and spoken input match, then the person is accepted. If they do not match,

the person is rejected and denied access. Voice is a very convenient verification system for use in telephonic transactions.

Voice reader technology is under development. Ambient sound can pose a problem. Voice patterns are extremely complex and vary significantly for a number of reasons. There is research investigating the usefulness of voice analysis for detecting a variety of conditions including the type of stress under which the person is speaking. Potential advantages include combining identification with the ability to communicate simple instructions and convey information. However, current low-cost versions of the technology focus on identifying variations from a desired standard, rather than on identifying the source of a set of sounds (for example, teaching someone to speak another language with a 'proper' accent, rather than identifying which speaker uttered a particular phrase). This technology shows promise and has been under investigation for many years. Obviously, it is limited to those who can speak at any given time in essentially their 'normal' voice. Currently, its usefulness in the WIC environment is questionable.

Pros:

Biometrics provide one of the most secure means of authenticating a benefit recipient's identity at the point of certification (to avoid dual enrollment), at the point of benefit issuance (to avoid dual participation), and at the point-of-sale (to avoid fraudulent use of food benefits). In an EBT/ESD environment, when multiple programs exist on a single card platform, the biometric could be shared across programs so that all programs could benefit from the reduction of fraud.

Cons:

State WIC staff raised a substantial number of concerns about biometrics. Of immediate concern is the cost effectiveness of a biometric program. Biometrics require an infrastructure that is anticipated to be very expensive. WIC staff believes that the cost of implementing the biometric program would far outweigh the amount of money recovered from prevention of dual participation.

The intrusiveness of the biometric and participant reception are also of concern. Many WIC staff members voiced the apprehension that participants' privacy could be compromised and that applicants might be reluctant to apply for benefits if they had to undergo a biometric check. WIC staff and WIC administrators at the State, local and Federal level have all voiced this concern. The WIC personnel interviewed about the use of biometrics were unanimous in their assertion that biometrics would have limited use in the WIC Program for the foreseeable future.

There has been considerable debate over the appropriateness of the use of finger-imaging technology in public assistance programs. The issue has come under the scrutiny of State governments in recent years, where some legislatures have embraced finger imaging proposals in an effort to control welfare fraud, while others have rejected proposals as being intrusive. To date, the programs most likely to be involved in biometrics initiatives are the Food Stamp Program, TANF, and Medicaid.

State Suggested WIC Uses for biometrics:

- **Dual Enrollment/Dual Participation Check** – Biometric "live" scans can be taken at the point of certification and compared against a database of biometric templates of enrollees/participants. This process could reduce the number of false instances of dual participation.

- **Prevention of Fraudulent Use of Benefits** – Biometric "live" scans can be taken at the point of sale to ensure that the food benefits are being used by the legitimate cardholder or the designated proxy.

- **Identity Authentication** – This technology can be used as a form of "electronic signature" both to identify the participant and proxy and to identify the staff person issuing benefits or doing certifications. Biometrics, in combination with smart cards, can be used as an alternative to digital signatures for participants and staff doing certifications.

D.2.4 CARD TECHNOLOGIES AND ELECTRONIC BENEFIT TRANSFER/ELECTRONIC SERVICE DELIVERY

Definitions:

Integrated Circuit Chip Card ("Smart Card") – A card into which one or more integrated circuits is inserted. A smart card with an integrated circuit chip

is able to perform data processing such as calculations or data storage and retrieval on-board the card.

Contact Interface – A chip card that allows interface through a contact. A contact is an electrical connecting surface on an ICC and/or interfacing device that permits a flow of energy current, thereby transmission of data.

Contactless Interface – An ICC that enables energy to flow between the card and the interfacing device without the use of contact. Instead, induction of high-frequency transmission techniques are used through a radio frequency (RF) interface.

Combo Card – An ICC that combines functionality of both contact and contactless interfaces.

Electronic Benefit Transfer (EBT) – The use of an electronic mechanism to transfer value from a program to a benefit recipient.

Electronic Service Delivery (ESD) – The use of a unique participant identifier and advanced electronic technology to provide integrated and efficient participant-centric service delivery.

Magnetic Stripe Card – A plastic card, usually with human-readable characters and/or imprinted characters on the front, and a machine-readable magnetic stripe on the back. The magnetic stripe usually contains identification and security information. Sometimes it also contains other very limited information. Normally, the use of a magnetic stripe card requires that the card device have real-time access to a remote computer system if it is to function properly. Credit cards are the most commonly seen form of magnetic stripe card.

Hybrid Card – Combines magnetic stripe card and smart card functions on a single credit card size device. The magnetic stripe and smart card functions are not necessarily related and with some exceptions are not normally read by the same devices.

Description:

EBT is an example of something that is not so much an emerging technology as an emerging implementation of existing technologies. It is part of a general attempt to step away from paper-bound systems to improve speed and accuracy while reducing costs. This technology is currently implemented via either magnetic stripe cards (like credit cards) or "smart" cards with an embedded computer processor and memory on board the card. In some cases, "hybrid" cards combining both technologies are being tested.

EBT is essentially the movement of benefits through electronic rather than through paper mediums. A good example, but not a "benefit" transfer, is the rapidly expanding use of Debit Cards rather than checks for everyday financial transactions, such as buying groceries. In this example, the debit card, which looks and performs like a magnetic stripe credit card, is used to identify the customer account at a bank. The card reading device also is supplied the dollar total for the transaction and forwards that information to the clearinghouse(s) used by the bank and the credit card/debit card company(ies). In most cases, the clearinghouse(s) must either have access to the bank computers, or have relatively small transaction limits it/they will accept and process in the absence of that connection.

To date, pilot programs and implementations of EBT have primarily focused on cash programs, such as Food Stamps and TANF, that have transactions that closely follow the simple, two-part financial model noted earlier. For those programs, the existing infrastructure provides the capability to support the "benefit" transaction within the same processes as the financial transactions. Assuming a sufficient volume of simple, compliant transactions, it is theoretically possible to reduce the costs of an electronic benefit transfer below the costs of the equivalent paper benefit transfer. To date, the early implementations confirm the technical feasibility of the EBT approach to simple transactions. WIC EBT is not the same as EBT for the type of programs noted above. Those are simple, two-part transactions. WIC transactions are fairly complex, multi-part events with a variable number of elements in each transaction. It does include the account and dollar amount items noted above. It

also includes a number of line items (0-N) per transaction. The line items include the UPC of the WIC Allowable Food and the price of the food item. As each item is scanned at the checkout lane, the system must first determine if the item is an approved WIC food. Once this check has been completed, the system must determine if the purchaser has sufficient balance in her/his WIC prescription to support the purchase. If the remaining prescription balance is sufficient, the amount of the purchase is added to the transaction total and the WIC prescription is decremented by the purchased amount. Thus, each of these line items must pass certain conditions: 1) is the item an allowable product and by definition exclude all other products. 2) is there enough remaining prescription balance and if so, each transaction must decrement the total amount remaining for each line item, and 3) are the items within the time-based limits for each of these line items.

The two approaches for implementing WIC EBT/ESD —magnetic stripe cards for on-line WIC EBT and integrated circuit chip cards for an off-line solution— are described below.

D.2.4.1 Smart Cards and EBT/ESD

The integrated circuit chip card, better known as a "smart card" is capable of reading and writing data. A smart card is essentially a "computer on a card" that allows a credit card-size card to maintain and process data. Data is written to the card in one location and retrieved from the card in another. The integrated chip on the card enables the card to store and retrieve data, perform processing such as calculations, and maintain applications that are carried on the card. The smart card's major advantage is that it enhances the portability and security of data. The card can be used to provide secure authentication of the cardholder's identity, to encrypt information, and to share data across programs.

In the WIC program, the smart card is currently being piloted to support Electronic Benefit Transfer/Electronic Service Delivery (EBT/ESD). The smart card is being used to support EBT, which uses the commercial payment structure to electronically redeem, settle, and reconcile WIC food benefits. In WIC off-line EBT programs, the smart card is used to hold the WIC prescription, which is then decremented as purchases are made at the retail store.

In an off-line solution, the cardholder's WIC prescription account balance is maintained on the card, with transactions stored at the vendor until the end-of-day processing, when batched transaction sets are sent to the EBT Processor. In the off-line EBT solution, the message flows take place between the Electronic Payment System (EPS) and the card acceptor device (i.e., intelligent smart card reader) and between the in-store EPS and the EBT Processor.

In some off-line environments, the smart card is also being used to provide ESD. Within the context of ESD, the smart card platform can provide far more than just delivery of economic benefits. In addition to the WIC prescription account balance, the card in an off-line system can be used to maintain demographic, health, referral, and appointment data that can be shared across programs. The off-line approach allows the exchange of data between disparate provider systems, as data can be read from the legacy system in one location, written to the card, and transported to another location by the cardholder. At the new location the data from the first program can be read from the card and used to update the second provider's legacy system. The use of the card in this way, to perform functionality beyond the transfer of value for nutritional benefits, is often thought of as the mainstay of Electronic Service Delivery.

Cooperating public health, social service, and nutrition programs could potentially share a multi-application card platform, and use it to re-think the eligibility determination process across programs. By capitalizing on the enhanced processing capability of a chip card, there is the potential to re-engineer the intake process to streamline the workflow so that common demographic and financial data used in the individual program's eligibility determination are collected and verified once, and then shared among programs. Through this streamlining of the intake process, the government can achieve efficiencies in operation and reductions in cost. To further reduce program costs, the smart card is used to assist multiple health care and social service agencies to share common health, nutrition, and immunization data across their programs so as to reduce duplication of data collection and services.

D.2.4.2 Magnetic Stripe Cards and EBT/ESD

The magnetic stripe card can also be used in the electronic delivery of WIC benefits. Typically, the magnetic stripe card is used to support on-line WIC. In an on-line solution, the cardholder's WIC prescription account balance is maintained on the EBT processor's host system. Transactions that take place against the WIC benefits are required to access the participant WIC account database residing at the EBT Processor's host system to complete the transaction. When a WIC participant makes a purchase at the retail store, the magnetic stripe card is read. The participant's Primary Account Number (PAN) is read from the magnetic stripe on the card. The participant is then prompted to enter a PIN number for security purposes. The PAN and the PIN are sent to the EBT host, which verifies the cardholder's account and PIN, and then either downloads the prescription to the store's Electronic Payment System or conducts transactions on-line against the WIC prescription. Additionally, the magnetic stripe card may be used to access other cash benefits (such as TANF or General Assistance) at ATMs.

A distinction between the off-line and on-line transaction processing flows is that the on-line flows do not include a WIC Settlement of Purchase or Hot Card Update transaction because the data required at the EBT Processor host system for settlement of an on-line transaction already exists at the host. The processing for all participant initiated WIC transactions takes place at the EBT Processor's host system, at which point the status of the participant's card can be validated against the EBT Processor's card database, and the database updated with the results of the participant's transaction. A similar procedure can be used for on-line ESD, where the participant's health record could be maintained at the ESD processor host.

As pilot projects validate the feasibility of EBT in the WIC environment and identify economically reasonable approaches to implementation, there will be increasing demand for EBT options in all WIC programs. At a minimum, all significant modifications to WIC systems should at least include EBT considerations at the design level. All new WIC systems definitely should include EBT at least at the design level and should have tested interfaces even though those interfaces may not actually be implemented in initial versions of the

systems. This will greatly reduce the ultimate costs of implementing EBT. When EBT begins to build momentum and acceptance, it will also be easier to modify, as well as easier to obtain approval to modify systems that were designed with EBT in mind. For all the reasons noted, EBT should be carefully considered and at least "designed in" to all new or extensively modified WIC systems.

Pros:

Card technology provides a mechanism that can ensure participants receive their full benefits with dignity, reduce the paper processing of an agency, increase the amount and specificity of data available on WIC food purchases, and speed the vendor payment process. By making data transportable, smart card technology allows data to be shared across disparate systems and programs. It also supports rigorous identification authentication processes and more secure transactions.

To date, there are very few pilot WIC EBT implementations. Although there are potential future cost savings for EBT, these cost savings are not the only reason for implementing EBT systems. Even if cost reductions remain elusive, there may be sufficient justification for EBT in other areas. Another key outcome of EBT is "mainstreaming" the process for the benefit participant. By moving the benefit transfer process more closely into the mainstream of financial transactions, especially at the point of sale, a number of benefits are reasonably anticipated. These include:

- a more "normal" and likely more dignified experience for the participant;
- assurance that the participant receives her full food prescription and does not obtain unauthorized and less nutritious foods;
- greater flexibility in the timing and quantity of purchased benefits;
- less need for paper and/or cash involvement in transactions;
- a faster, simpler process for the vendor;
- better information for cash management; and
- less delay associated with the process for everyone involved, including the general public.

In addition, there are demonstrable benefits in terms of security and controls over the process, as well as the speed improvements that have been noted earlier.

Cons:

The most significant hurdle for implementing card technology is the lack of a card infrastructure. While magnetic stripe card readers are readily available in most retail stores, they are not available at many providers or WIC clinics. Even fewer vendors, providers, or agencies have access to smart card readers. EBT for the WIC Program may not be cost effective until the technology is more widely deployed.

This does not imply that WIC EBT is not feasible. It simply notes that attempting to implement WIC EBT within the constraints of the existing infrastructure is probably not economically viable at this time. The additional benefits, such as those noted above, may outweigh the economic implications. More importantly, implementing WIC EBT by other means still appears to hold promise, economic and otherwise. There are preliminary EBT pilots that are evaluating alternative infrastructures that would make it economically feasible. Among these are "dedicated virtual network" implementations, using a variety of infrastructures such as off-peak dial-up and/or internet tunneling protocols to avoid the expensive, general-purpose financial transaction infrastructure. Experiments being planned include both on-line and off-line EBT systems that explore alternate approaches to implementation.

Additional problems center on the currency of information shared across programs and the reliability of the data on the card. If the card is not updated properly by each program, the sharing programs could access out-of-date information.

Because participants use different names in different programs, move often, and change names and households often, it could be costly to re-issue cards each time these changes occur. Once again, the information on the card could be inaccurate.

State Suggested Uses in WIC:

- **Support Common Intake Processes** – Many health, social service, and nutrition programs use the same demographic, income, and household data to determine eligibility. By maintaining this common data on a card for use in a common intake process, the programs could enter and verify data only once, and could then share data across programs. This would reduce staff time and improve the efficiency of service delivery.

- **Enable Data Sharing Across Programs –** Sharing demographic, health, nutrition, medical test, immunization, program participation, and appointment data across multiple programs could reduce the duplication of services, improve the quality of health care, and promote referrals.

- **Enable More Robust Participant Identity Authentication** – The card provides the mechanism to implement various technologies such as digital photos, digitized signature, digital certificates, or biometrics to enhance cardholder authentication.

- **Track Nutrition Education Attendance** – The local agency could use the card to track when participants came to attend nutrition classes or pick up food instruments. Thus, the staff would not have to manually input participant attendance or maintain a manual record of food instrument pick-ups. The electronically collected attendance tracking data could be used to update the participant's Care Plan, to generate class attendance rosters, to support the evaluation of class popularity, and to reduce manual data entry required of staff.

- **Support Referrals** – The card could maintain notes on a participant to the receiving program from the referring program. It could also track referral results so that the WIC program could get verification that the participant actually made use of the referral.

- **Support Appointments** – The card could track appointments so that the participant could check at a kiosk or at the grocery store for upcoming appointment. The participant could check on appointment dates for herself or her family. This could reduce "No Show" rates.

- **Facilitate Participant Transfers** – The card could maintain Verification of Certification data which would facilitate the transfer process, particularly if a clinic needed to wait to receive the participant's records from another agency

D.2.5 COMPUTER-BASED TRAINING (CBT)/DISTANCE LEARNING

Definitions:

Computer Based Training (CBT) – A training program individual users can use on their computer workstation for remedial or advanced instruction of functions. It provides a grading of the training session.

Distance Learning – The use of emerging technologies such as video conferencing, satellite communications, or Internet technologies to enable the conduct of classes in which the teacher and the students are in remote locations.

Description:

CBT is not so much an emerging technology as an emerging or expanding implementation of existing technologies. CBT lacks the ability of a good instructor to sense confusion on the part of the student, or to help the student approach the material from a different direction to facilitate understanding. However, properly implemented, it can provide a considerable degree of feedback and re-try instruction to students. To some extent, that feedback and re-try process can vary the type of presentation in a somewhat random attempt to find a method that matches the student's learning style, or at least provides some alternate styles in an attempt to assist the student. In general, CBT stands somewhere between seminar instruction by a competent teacher at one extreme and a videotape lesson at the other.

The primary improvements in recent years are the result of combining computer-based instruction with newer interactive, graphical computer systems, under proven guidelines for human learning. Wherever the same material is presented many times in the same format, and confirmation of the student's absorption of knowledge is a necessity, CBT has strong potential for both economic and learning success.

Pros:

CBT allows training to occur at the trainee's convenience and in the trainee's preferred language. The CBT lesson can be scheduled whenever the participant wishes and there is no problem about the class "being filled." Whether the

trainee is a WIC staff member being trained on the use of a new WIC system or a new WIC policy (e.g., the introduction of new risk factors), or a participant receiving basic non-customized nutrition education, the CBT can free instructors for customized employee or participant training. Working participants could even borrow the CBT programs to utilize outside the clinic, when the clinic is closed.

Furthermore, CBT can be an inexpensive way to present many copies of the same lesson. If the same lesson is taught many times to many students in the same general target audience, CBT can deliver that training at a far lower total cost. It can also eliminate the variables of different instructors teaching each class.

Cons:

Generally, CBT is far more expensive to set up, on a per-lesson basis, than other instructional methods. It requires all the steps of classroom instruction setup, plus other production, coordination, and programming considerations. It is more expensive to set up a flexible, responsive CBT lesson than to set up that same lesson for classroom presentation. It is also often more expensive to modify a CBT class than it is to modify the corresponding Video or Instructor-led class.

Additionally, the CBT lacks the human interaction that can be so important to successful nutrition counseling. However, if CBT were used for dissemination of basic nutrition information, the WIC staff could be more available for one-on-one consultations needed for high risk participants.

State Suggested Uses in WIC:

- **Support Staff Training** – CBT could facilitate the roll-out of a new WIC system or policy. It can encourage the standardization of messages across WIC programs both within and across States.
- **Provide Basic WIC Orientation/Nutrition Education for Participants** – CBT could be particularly effective for working WIC participants. The participant could come at a convenient time and take the module. The built-in review and testing could ensure that the participant mastered the basic concepts.
- **Orient Staff About Referral Organizations** – CBT could serve as a mechanism to provide basic program information to WIC staff about the

programs to which they are referring participants. By improving knowledge about existing community resources, it could help encourage the frequency of referrals and improve the quality of service.

D.2.6 ELECTRONIC SIGNATURES

Definitions:

Digital Signature – A unique electronic signature that accompanies documents and messages. The digital signature serves two primary functions: verifies the authenticity of the party sending the message, and verifies that the content of the message has not been altered.

Public (Asymmetric) Key Cryptography – A type of cryptography that uses a key pair of mathematically related cryptographic keys. The public key can be made available to anyone who wishes to use it and can encrypt information or verify a digital signature; the private key is kept secret by its holder and can decrypt information or generate a digital signature.

Public Key Infrastructure (PKI) – The architecture, organization, techniques, practices, and procedures that collectively support the implementation and operation of a certificate-based public key cryptographic system. Further, a communications infrastructure that allows users to exchange money and data over the Internet in a secure environment. There are four basic components to the PKI: the certificate authority (CA) responsible for issuing and verifying digital certificates, the registration authority (RA) which provides verification to the CA prior to issuance of digital certificates, one or multiple directories to hold certificates (with public keys), and a system for managing the certificates. Included also in a PKI are the certificate policies and agreements among parties that document the operating rules, procedural policies, and liabilities of the parties operating within the PKI.

Private Key – A mathematical key (kept secret by the holder) used to create digital signatures, and, depending upon the algorithm, to decrypt messages or files encrypted (for confidentiality) with the corresponding public key.

Public Key – A mathematical key that can be publicly available and which is used to verify signatures created with its corresponding private key. Depending

on the algorithm, public keys are also used to encrypt messages or files which are then decrypted with the corresponding private key.

Hashing – A software process which computes a value (hashword) from a particular data unit in a manner that enables detection of intentional/unauthorized or unintentional/accidental data modification by the recipient of the data.

Digitized Signature – A written signature that has been read by a computer scanner and converted into digital data. It is a capability for recording signatures on an electronic device in a digital format. The most common publicly visible use at present is in capturing signature images for credit card purchases in retail stores.

Other terminology relating to electronic signatures may be found in the Glossary.

Description:

Electronic signatures encompass a broad field and include both digital and digitized signatures. These two types of electronic signatures are very different, but they are often confused. The two not only are created through very divergent processes, but also they are used for vastly different purposes. The sections below differentiate between the two of them.

D.2.6.1 Digital Signature

Digital Signatures rely on public key cryptography and make use of the Public Key Infrastructure (as defined above). A public key cryptography protocol is used for sender authentication—digital signatures. For instance, Alice, to digitally sign a document, puts her private key and the document together (or the document alone) and performs a hash computation on the composite to generate a unique number called the digital signature. Therefore, when an electronic document such as a proxy authorization form, is run through this method, the output is a unique digital signature of the document.

Verification of the signature only requires knowledge of the public key. So Alice can sign a message by generating a signature only she can generate, and other people can verify that it is Alice's signature, but cannot forge her signature. This

is called a signature because it shares with handwritten signatures the property that it is possible to recognize a signature as authentic without being able to forge it.

A secure digital signature system thus consists of two parts: a method of signing a document such that forgery is infeasible, and a method of verifying that a signature was actually generated by whomever it represents. Furthermore, the secure digital signatures cannot be repudiated; that is, the signer of a document cannot later disown it by claiming it was forged. This method is the basis for secure electronic commerce, the foundation of Electronic Service Delivery.

The steps for creating and successfully transmitting a digitally signed document are described below:

Bob, the message sender:

- Creates a message to send to Alice
- Applies a hash function to create a message digest (digital signature)
- Encrypts the original message as well as the message digest with his private key
- Sends the encrypted message and digital signature to Alice.

Alice, the message receiver:

- Decrypts the message using Bob's public key
- Decrypts the digital signature with Bob's public key to recover the message digest
- Applies the same hash function that Bob used to the original message to obtain a message digest
- Compares the message digest that she obtains with the message digest received from Bob. If they match, the digital signature is verified. Alice can be sure that a) the message came from Bob, and b) the message was not altered during the transmission.

Digital signatures are self-authenticating; that is, if a single byte of the digitally signed message has been altered, the decryption process will reveal that alteration. The message is retrieved twice: once from the decrypted digital

signature and again by recomputing it directly from the input data. If the two messages do not match, the text has been altered. Thus, digital signatures are highly secure and robust.

D.2.7 DIGITIZED SIGNATURE

The technology to digitize a person's handwritten signature has been around for several years. It is a writing pen type of instrument that a person uses to sign his/her signature on a signature pad. The pen has miniature transducers attached to the tip of the pen and/or the writing pad that measure the pressures applied by the person with the pen as the signature is written. The better designs measure pressure, vectors (direction and speed), and distances traveled at various points in the strokes, as well as the form of the resulting signature. It is extremely difficult, maybe even impossible, for a forger to duplicate all those factors at the same time. However, most of the less expensive units merely capture a two-dimensional graphic of the end result (e.g., a 'picture' of the signature) plus some very limited velocity information such as the time to complete.

Pros:

Electronic (i.e., Digital or Digitized) Signatures would allow the WIC program to move to a substantially paperless process so that paper files are unnecessary. The reduction of paper could result in streamlined processing, fewer staff hours spent on filing and retrieving information, reduction in storage space, improved data retrieval processes, enhanced and quicker service, and reductions in cost. Many studies have shown that the conversion from paper to electronic forms submission and processing saves substantial time and money in government agencies. Additionally, electronic signatures are highly secure.

Digitized signatures cost less to implement than digital signatures. Signature pads cost from $50 - $400 each. The greatest expense is the software that accompanies the devices, and that cost will vary depending on the specific application. For a stand-alone system, off-the-shelf software can be as low as $3,500 for a 25-user license.

Cons:

The cost of implementing digital signature technology may be a substantial barrier for the WIC community. Particularly in the case of digital signatures, the infrastructure needed to put a PKI in operation is substantial. The overhead associated with processing digital signatures may well outweigh the savings realized from the migration from paper to electronic forms processing.

State Suggested Uses in WIC:

- **Support Electronic Forms Submission** – By national policy, a number of forms, such as the Rights and Responsibilities, Zero Income Affidavit, and Proxy Authorization Forms, within the WIC program must be maintained for record keeping purposes with the participant's signature. Because of this requirement, many programs continue to maintain paper participant files, which are expensive and time consuming to maintain. Electronic signatures could meet the policy requirement for signed, legally binding forms.

- **Replace the Manual Food Instrument Pick-Up Log/Check Stub Signature** – Once again, because of audit requirements, the local agency must maintain a manual log to document that a participant or the participant's proxy has received the printed food instruments. The electronic signature could meet this requirement and allow the WIC agency to move to an electronic food instrument log.

D.2.8 GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Definitions:

Geographic Information System – A system that processes geographic information such as mapping of geographic points or areas or using mathematical algorithms for measuring distance.

Description:

Geographic information is becoming a vital capability for public health officials to investigate a variety of health-related factors and the spread of disease. It is also pervasive in many other application areas. Its potential for WIC is also emerging as computer systems become more capable, faster, and able to handle larger quantities of data.

Although one typically identifies GIS with software tools for map plotting/printing, there are significant GIS functions that are performed without

those tools. Hence, one needs to think of GIS in broader terms than just a set of specialized tools (software and hardware) when looking at geographic related problems.

Technically speaking, it can be as complex as three- or even four-dimensional mapping of geographic points or areas, or as simple as the application of known mathematical algorithms for measuring distance. The level of complexity involved depends upon the type of information to be displayed and the manner in which it must be viewed. For example, modeling the movement of pathogen vectors in a stadium, or a city, requires a complex approach. However, GIS can be a simple report of how many participants live within a two-mile radius of a WIC clinic and ultimately to show the geographic dispersing of potential WIC participants. The last example would require a Geographic Information System tool to plot the results on a map, whereas the first two examples do not. For another example, comparing areas of high or low participation in nutrition programs, and/or comparing participation against other health factors, can be done with or without the "mapping" features of GIS. Depending on the desired purpose, a non-map application can be much more useful than a map application.

The Centers for Disease Control (CDC) has available for free download from its web site (www.cdc.gov/epo/epi/software.htm) a rudimentary DOS-based mapping system called EPI Map. CDC is developing a more robust Windows-based version, called EPI Map 2000. A free copy of EPI Info that provides many data management and analysis techniques can also be downloaded from this web site.

Typically, the majority of uses of geographic information for a WIC program are at the State agency-level management. However, there are practical applications at the clinic level.

Pros:

GIS systems provide substantially enhanced convenience for participants. By improving the quality and convenience of vendor and program referrals, participants are far more likely to take advantage of the referrals. The use of the

GIS can result in highly improved quality of service. The GIS is a tool that provides substantial program analysis capabilities, as described below.

Cons:

GIS systems are typically expensive to implement. However, the CDC offers free software that can provide at least basic capabilities. A GIS would require WIC staff to collect residential addresses in addition to mailing addresses, which may result in increased data entry. Also, data entry consistency would be very important when using a GIS. Abbreviations must be standard or the system may not be able to determine the appropriate information.

Zip codes, which are used for GIS mapping, may change over time. GIS planners need to take this into consideration, as historical data may become useless if zip codes change. GIS planners may want to consider using census tracts, which may be subdivided but do not change.

State Suggested Uses for WIC:

- **Enhance Program Effectiveness** – Public health programs have a large cross-population of participants. There could be a report or a plot showing a comparison of the non-WIC population to WIC participant population that would give WIC staff information as to where they can reach out to potential WIC participants. The map would be more useful for visualizing the magnitude of the opportunity, than to actually quantify and contact potential participants. Another application is to show outreach and referral activities/demographics. Yet another application is to compare health characteristics for a geographic area. Where there is a migrant worker population, there may be some useful trends. For example, it might be useful to know where to locate temporary WIC staff when needed based upon growing seasons, etc. For mobile/temporary locations of WIC clinics, the GIS could show the geographic placement of participants to determine if there is a need to relocate the clinic so it is more accessible to participants.

- **Enhance Participant Service** – The participants could use the GIS to help select vendors that are convenient to participant's home and provide a map of vendor and referral locations for WIC participants to use. The WIC staff could use the GIS in referring participants to new WIC clinics in other parts of state when a participant is transferring.

- **Enhance Vendor Management** – There are vendor management applications, such as plotting the vendor-to-participant ratio for a geographic area to determine if there are sufficient vendors in a

geographic location to support the need; plotting the redemption dollar amounts over a geographic area, filtering by peer group to see a trend as it is related to geography; and plotting the redemption profile across vendors to determine if there are any unusual patterns that could be related to fraud.

D.2.9 KIOSKS

Definitions:

Kiosk – A public access terminal, located at various locations within the community, at which users may access one or more computer applications.

Description:

The kiosk may provide access to an application housed in a central data processing facility, based upon the Internet, or resident locally in the central processing unit of the kiosk. A kiosk typically has an enclosure with light box, a touch-screen display, a printer, a PIN pad, card reader (if used for a card application), a CPU or PC, and a power supply. Both freestanding and desktop versions may be used. Often touch-screen technology that prompts the participant to select a function by touching an option displayed on the screen is used. To be effective, kiosk applications must be straightforward, easily learned and understood without training, and usable by most or all of the intended audience with little or no training.

Kiosks are highly useful for presenting certain types of information in response to predictable queries. For example, presenting "You are Here" and graphical as well as character (written) directions from "here" to a known set of destination locations, preferably selectable from a list, is a useful and practical implementation of kiosk capabilities. They are also useful for presenting "account status" information in situations where the identity of the inquiring person is either easily established or is not important. It is also relatively simple to set up kiosks to work with a variety of human languages, as well as to use icons and graphics that have universal or near-universal recognition.

Obvious uses for WIC include displaying account information (benefits available, next appointment date/time), as well as location of nearest WIC office or vendor. It is also possible to use kiosks to provide 'pre-screening' for

eligibility and/or to encourage people to inquire as to their potential eligibility. However, such use can easily slip into the weaknesses of the kiosk approach. It is very easy to erroneously exclude a candidate based on limited information.

Kiosks generally have no keyboard or similar data entry device. It must be noted that kiosks are actually a totally different interface from a workstation and are intended for and suited to a totally different use. Some GUI workstation designs can be fairly readily modified to an at least workable kiosk interface. However, a good kiosk design is almost never modifiable into a workable workstation interface. Usability testing, with members of the intended target audience, is absolutely essential to kiosk interface design.

Most kiosk designs fail because it is easier for a user to just pick up a phone and ask a human than it is to use the kiosk. To be effective and accepted, a kiosk must be at least as easy to use as asking a human. Another factor when considering kiosks is the availability and currency of data. If the kiosk is used to deliver volatile data (such as benefits remaining), it must either have truly current data or it must 'know' how current its data is. It must also accurately and simply convey that information to the user.

Within those constraints of purpose and usability, kiosks are highly effective information distribution devices.

Pros:

Kiosks present the opportunity to distribute information about WIC to the public outside the WIC clinic environment and to extend the practical "hours" of service to times when the WIC clinic is not open. Kiosks are viewed as a viable mechanism for delivering general information about WIC, as well as specific participant information, to working women who may not be available to visit the WIC clinics during working hours. In this context, the kiosk could provide working participants with some types of nutrition education (through CBT guided programs), download of benefits, and dietary assessment. In essence, the kiosks could encourage participant responsibility for the health of herself and her family.

A computer can lend a non-judgmental air to dietary assessment. If the participant identifies herself, the kiosk can track her progress over time, not only with dietary assessments, but also with nutrition education.

A Kiosk is an effective ESD tool. By sharing a public access kiosk with other programs and agencies, WIC can lower its equipment costs as well as on-going maintenance costs.

Additionally, the kiosk could answer general questions from the public and encourage applicants who might not otherwise obtain information about the program. Staff time spent answering routine questions could be redirected to more effective nutrition counseling and high risk monitoring.

Cons:

Despite the potential benefits, a number of barriers remain to prevent kiosks from becoming commonplace within the WIC program. One key issue is the attitude of potential participants. Many WIC staff members assert that their participants are unlikely to use the kiosk. People still have to get to the kiosk location, and may have to wait in line to use the kiosk if it's crowded. Furthermore, literacy problems could prevent potential participants from utilizing the kiosks. A related concern is that participants uneducated in the use of computer technology could be intimidated. Their lack of understanding could make them feel uncomfortable interacting with the technology, as well as result in potential problems interacting with the kiosk software.

Related to the problems inherent to participant perceptions is the impersonal nature of the kiosk interaction. Many WIC staff are concerned that the interactions would not be as effective as in-person contacts. The personal touch is highly effective in providing quality service and the lack of human contact could be problematic. Particularly of particular concern is the idea of pre-eligibility screening that could erroneously eliminate applicants. Additionally, the use of the kiosk to deliver nutrition education, whether through video tapes or CBT, would eliminate the give and take between participant and nutritionists that is so valuable in nutrition education classes and individualized counseling sessions.

The initial cost of deploying the kiosks is also a barrier. Not only is the initial cost of the equipment an issue, but the ongoing maintenance and upkeep could require significant staff time and resources. Kiosks require constant monitoring to ensure they are performing properly. For example, if the printer runs out of paper or jams, the kiosk may be useless to participants.

A final issue of concern is security. There are several aspects to this issue. The security of the equipment, as well as the confidentiality of participant's information may be of concern. Proper security precautions must accompany any planned kiosk implementations.

State Suggested Uses in WIC:

- **Enhance Public Information/Marketing** – Virtually all WIC staff agreed on the usefulness of the kiosk to introduce the public to the WIC program. The kiosk is an effective delivery mechanism to present basic information about the WIC program. It could be used to market the program to target populations and encourage new applicants.

- **Enhance Applicant Convenience** – The kiosk could perform preliminary eligibility screening for adjunctive and income eligibility. Maps could help new applicants identify the closest clinics. A kiosk-based application could allow applicants to fill out their twenty-four hour dietary recall or food frequency and calculate a nutrition assessment report to bring to the certification appointment. It could also provide information on documentation required for the certification appointment.

- **Enhance Participant Convenience** – The kiosk could provide various types of information to ongoing participants to make their use of WIC services easier and more timely. For example, the kiosk could allow the participant to view upcoming appointments for the family, print out needed immunization records for children, provide the EBT prescription balance prior to shopping, and perform ongoing dietary assessment. Working participants could obtain at least some of their nutrition education outside the clinic through video tapes or CBT. In the EBT environment, the kiosk could be a location to report lost/stolen/damaged cards. Finally, it could be used to receive participant email reminders.

D.2.10 PALM-HELD COMPUTERS/PERSONAL DIGITAL ASSISTANTS

Definitions:

Palm-Held Computers – Small computers whose size corresponds to a hand that makes them useful where it is inconvenient to use or carry a laptop computer. They are also called Personal Digital Assistants (PDAs).

Description:

In general, the PDA devices are designed to support intake and very simple movement of data files between the palm unit and a larger computer. They can transfer data to a larger computer via wired or infrared transmission.

For WIC, clinic staff could use PDA's where it is inconvenient to carry a laptop computer, or to record food prices at a vendor location. Clinic staff could collect information such as medical test results or other items of small and predictable size. PDA's are generally inconvenient for large or even moderate-scale data capture. For example, they would work well for the capture of weight, hematocrit, etc. With careful programming, and attention to the usability of the interface, they might be useful for capturing income, phone numbers, or fixed-category information held in on-board tables with easy selection routines. In any case, the design intent of PDA's in such an environment is that the data on them are later uploaded to a larger computer where such data are needed.

Pros:

The most significant advantage of the PDA is its extreme portability. The small size makes it convenient for use during compliance buys or in a mobile clinic where space is extremely limited.

Cons:

The disadvantages generally include lack of flexibility, low speed, limited uses, and inconvenience for many purposes. They are not useful or convenient for capturing non-trivial volumes of larger-scale information such as addresses or notes. Generally, they are used for medium- to large-scale data entry in situations where a laptop is simply too large and cumbersome to be practical. That situation is unlikely to exist in most clinics. In any case, the size factor must be balanced against the difficulty of use factor.

There are also issues surrounding the additional layer of processing and data ownership that are raised by the use of PDAs. For example, what happens when conflicting information is loaded into two palm-tops, then transferred into a

larger system? (Note that this issue can occur with any remote or portable computing equipment)

State Suggested WIC Uses:

- **Price Surveys in Vendor Stores** – One of the best applications of the PDA is for price surveys in retail stores. The hand held device is convenient for the staff person to use as she moves through the store aisles collecting price data.

- **Notes During Compliance Buys** – Another in-store application for the PDA is to capture notes during compliance buys or for routine store monitoring. PDAs would probably be best suited to vendor management functions.

- **Entry of Health Data in Portable Clinics** – Mobile clinics set-up in vans or vehicles of other types typically have little room to use lap top computers. PDAs could collect small amounts of health data for upload to the main WIC system.

- **Dietary Recall in WIC Waiting Room** – A PDA application could allow entry of food codes and amounts for completion of an electronic dietary recall form. This could then be uploaded into the WIC system for nutrition analysis and assessment.

D.2.11 WEB-BASED DATA COLLECTION

Definitions:

Web-Based Application – A computer application that presents a data entry form via the Internet. A Web browser is used to present the Web page containing the data collection form to the user who can then enter data directly into the form displayed on the Web page. The data collected through this form can be reformatted or translated and transmitted via a network to other data processing systems.

Description:

The use of this technology requires discussion in two separate areas. First, as an enabling communications infrastructure technology, and second as a different implementation approach. There is significant potential to use the Internet as a 'tunnel' through which data is transmitted regardless of the underlying application systems. There is significant flexibility and bandwidth availability in this mode and usually at significant cost reductions from other network

implementations. However, there are limitations and considerations. Most states have at least some areas where there is no local phone call attachment to an Internet Service Provider (ISP). Additionally, most states still have some areas where the quality of the available dial-up networks will not support communications at 'reasonable' speeds. Any attempt to use the Internet as a support infrastructure for such 'tunneling' must allow for those locations where that implementation is either not possible or not practical. For example, the cost of sustained, long-distance, intra-state phone calls would quickly outweigh the savings available elsewhere in such 'private virtual network'. If possible and appropriate, WIC programs should make use of the cost savings potential in this technology. However, WIC programs need to assure themselves that the preliminary analysis identifies all sites requiring connections and verifies the availability of low-cost connections for all sites.

The second area regarding implementation is more complex. Any use of the Web as an enabling platform for applications must be approached from a different direction than with any of the "traditional" application development approaches. While internet-based applications share some common characteristics with GUI and with transaction-oriented applications, there are also fundamental and structural differences from either of those types. The potential advantages of using the Internet for applications have little to do with graphics or transaction processing, either of which is done at least as well, and generally better, in other technologies.

The advantage of browser-centric applications based upon either an inter- or intra-net approach is in the realm of software maintenance and distribution. Both networking approaches have advantages in the area of actual physical distribution of program code into local computers as well as a potential significant improvement in the ability to use a variety of computer hardware and operating systems as concurrent platforms for the same application code.

WIC systems can take limited advantage of the areas that are already opening up. Very small volume, low speed, low bandwidth sub-applications are becoming feasible. One use that already shows potential is training applets (small-scale applications), including "help" for users of WIC applications. Another area with

current promise is small, stand-alone sub-systems providing services that can be shared between multiple WIC programs. For example, there are current pilot projects to develop a "Web-site" facility for USDA and the states to maintain "authorized UPC lists" for authorized foods. These and similar areas, where there is little or no demand for "performance" are already beginning to be implemented in a practical manner.

Pros:

Web-based applications provide a convenient approach to providing wide-scale availability to application software. The Web provides a highly accessible vehicle for providing functionality to various WIC stakeholders. The Web-based application is particularly well-suited to encouraging standardized processes across States. For example, a nationwide UPC database of WIC approved foods could promote standardization of these values across programs. Similarly, the use of a standard vendor form for vendors maintaining outlets in multiple states would provide substantial convenience to retailers. Immunization and other standardized health data could also be shared across the Internet, providing that adequate security was addressed to ensure patient privacy and confidentiality. Many of the participant applications suggested in the sections on kiosks could be adapted to web applications.

Cons:

Perhaps the biggest issue concerning the use of Web-based applications is the provision of adequate security. Of particular concern is the ability to authenticate the user 's identity and rights of access in cyberspace. This concern is increasingly being addressed through the use of digital certificates and/or biometrics maintained on smart cards. These technologies provide a promising mechanism for ensuring robust identity verification. In addition to identity authentication and non-repudiation, PKI provides a mechanism for encrypting transactions to ensure secure transmissions across open networks such as the Internet. Closely related to this security issue is the concomitant concern of ensuring participant confidentiality and privacy of data.

Yet another problem with Web-based applications is the growing "information divide" that presently entails increasing disparities between the information "haves" and "have nots". While there are myriad applications that could enhance participant convenience, few WIC participants are likely to have home access to the Internet. Therefore, applications to enhance customer convenience are not likely to be highly used, especially in the near-term. Needed Internet access would have to be provided in public locations such as community centers, libraries, and public health clinics to make these Web-based applications generally available to WIC's participants.

State Suggested WIC Uses:

Many of the applications envisioned for the kiosk could also be delivered using Web-based application:

- **Enhance Communication and Standardization Among the States** – Web-based applications could conveniently provide WIC information to multiple state programs. An FNS Web-site could be used to provide a UPC Database of WIC Approved Foods, WIC policy updates, explanation and/or modification of Risk Factors, and dissemination of policy changes affecting multiple programs.

- **Enhance Service to Vendors** – Using the Web to disseminate the updated UPC table would make this onerous task less complex. Yet another area is a standardized vendor application that would collect much (if not all) of the data needed by State Programs for vendor authorization. State specific information could continue to be addressed through a State Web site. Additionally the Web-site could provide appropriate notifications to vendors.

- **Improve Integration of Health and Immunization Programs** – The Internet provides the opportunity for a virtual patient account that securely retrieves data from multiple legacy patient systems and/or immunization registries and displays it through a Web-application to authorized program staff, providers, and patients. Additionally the application could be used to exchange referral and appointment information.

- **Enhance Public Information/Marketing** – Web-based applications could introduce the public to the WIC program. The WIC web site is an effective delivery mechanism to present basic information about the WIC program. It could market the program to target populations and encourage new applicants.

- **Enhance Applicant Convenience** – The web-site could perform preliminary eligibility screening for adjunctive and income eligibility. Maps could help new applicants identify the closest clinics. A web-based application could allow applicants to fill out their twenty-four hour dietary recall or food frequency and calculate a nutrition assessment report to bring to the certification appointment. It could also provide information on documentation required for the certification appointment.

- **Enhance Participant Convenience. –** The web site could provide various types of information to ongoing participants to make their use of WIC services easier and more timely. For example, the kiosk could be used to view upcoming appointments for the family and to schedule re-certification appointments, display needed immunization records for children, provide the EBT prescription balance prior to shopping, and perform ongoing dietary assessment. Working participants could obtain at least some of their nutrition education outside the clinic through videos downloaded from the Internet. Finally, it could be used to receive participant email reminders.

D.2.12 WIRELESS COMMUNICATIONS

Definitions:

Wireless Network – A network capability used in place of a cabled/wired local area network. Wireless networks can be used in portable/mobile situations.

Description:

Wireless networks use radio or light devices instead of wires or cables to conduct transmissions of data. Satellite transmission can also be used in place of hard wiring a location. Wireless communications allow lap top computers to move throughout a facility without being connected to an outlet. The placement of antennae are the only limits for the mobility of the computing resources. Additionally, wireless networks can be used in outdoor environments, providing substantial flexibility to remote locations.

Wireless networks are particularly well-suited to satellite or temporary clinics that do not have telephone dial-up capability. They are also applicable to mobile clinics established in vans and other vehicles.

Pros:

Wireless networks provide substantial flexibility and allow mobility of WIC staff. This mobility may allow WIC staff to move freely within the building or to easily adapt a satellite clinic to temporary quarters.

Cons:

This biggest problem with wireless networks is their slow rate of data transmission. Depending on the environment, they can be substantially slower than wired networks. Additionally, various factors can impede the transmission field and adversely affect the quality of transmission. Finally, wireless networks require adequate security provisions to ensure that transmissions are not intercepted and confidential data compromised.

State Suggested WIC Uses:

- **Temporary/Mobile Clinics** – Wireless networks are particularly important in the WIC program where many clinics must move among various temporary quarters to deliver service. The Wireless networks enhance flexibility and mobility.

D.2.13 SCANFORM TECHNOLOGY

Definitions:

OCR: Optical Character Recognition.

Description:

Special paper forms, such as enrollment applications, are completed and returned to the clinic, local agency or State agency. The completed form is scanned into the computer, verified for accuracy, and processed.

Pros:

Use of this automated tool could decrease clerical/ data entry errors and speed the processing of paper documents.

Cons:

This approach increases equipment costs and perpetuates the paper process.

State Suggested WIC Uses:

Using scanform technology could serve as an interim step between the paper environment and a fully automated approach in which vendor forms are completed online. This technology could be used for:

- Participant enrollment applications
- Vendor enrollment applications
- Vendor food price forms

D.2.14 SUMMARY

There are emerging technologies that will have significant impact on WIC systems over the next decade. Like the technology itself, the impact upon WIC cannot be precisely predicted. However, some of the emerging technologies will reach mainstream status in the near future and will be highly useful, or even absolutely necessary, to WIC programs.

As State agencies develop new systems, they should employ flexibility toward later incorporation of significant and likely helpful new technologies. In some cases, it will be possible to implement at least initial aspects of the new technologies in WIC systems. In a few cases, it will be possible to take full advantage of new and highly useful technologies as WIC systems are built or updated.

The key to success is flexibility and an awareness of these technologies. However, it is critical that decision makers be aware of both strengths and weaknesses. A technology should be incorporated only because it can provide a significant defined benefit, never as an end in itself. All technologies, especially emerging technologies, provide both risk and promise, as well as reward and cost. Once the desired functionality is established, all available technologies, both established and emerging, should be reviewed to determine which combination provides the greatest benefit at the least cost and risk.