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GRI GOVERNMENTAL RESEARCH INSTITUTE
915 OLIVE ST., ROOM 908 • ST. LOUIS, MISSOURI 63101 • (314) 241-3063

VICTOR D. BRANNON
Director

CHARLES F. LAMMERS
Assistant Director

April 21, 1980

Mrs. Christine Lundy
Acquisition Coordinator, NCJRS
Acquisition Report Dept.
Box 6000
Rockville, MD 20850

Dear Mrs. Lundy:

In response to your request of April 17, 1980, we are sending you copies of the five research reports which we prepared to help the local governments in the City of St. Louis and St. Louis County develop a 911 emergency call system. There is no charge for the reports.

You may know that a 911 system became operative in the City of St. Louis and St. Louis County the latter part of February 1980. Several local officials have stated that the many municipal, county, and fire district governments would never have been able to make the system a reality without our assistance.

Sincerely,

Victor D. Brannon

Victor D. Brannon
Director

VDB/sgs

DISTRIBUTING THE RECURRING CHARGES FOR A 911 EMERGENCY CALL SYSTEM AMONG LOCAL GOVERNMENTS IN ST. LOUIS COUNTY
--SOME ALTERNATIVE FORMULAS--

The Fourth in a Series of Reports
Prepared at the Request of

THE ST. LOUIS COUNTY COUNCIL
and
THE ST. LOUIS COUNTY MUNICIPAL LEAGUE

GOVERNMENTAL RESEARCH INSTITUTE
915 Olive, Rm. 908
St. Louis, Missouri 63101

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DISTRIBUTING THE RECURRING CHARGES FOR A 911 EMERGENCY CALL SYSTEM AMONG LOCAL GOVERNMENTS IN ST. LOUIS COUNTY
--SOME ALTERNATIVE FORMULAS--

Introduction

The subject of this report, the fourth and last in the Institute's series on the proposed 911 Emergency Call System for St. Louis and St. Louis County, is the allocation of St. Louis County's share of the annual recurring charges for the system among the County, municipal, and fire district governments. Recognizing that different criteria for distributing the costs will have different effects on the share of the recurring costs borne by each of the governments, the Institute is presenting alternative formulas based on different criteria, so that the various options can be explored.

In addition to giving the alternative formulas, this report presents the rationale for each method of distributing the recurring costs. Also presented are the advantages and disadvantages of distributing the costs on the basis of each distribution method.

In its earlier reports, the Institute described the features of the proposed St. Louis area 911 Emergency System and gave a detailed breakdown of the estimated one-time and recurring charges for the proposed system (Report 1); developed a list of emergency dispatching agencies in St. Louis County, the areas that the agencies serve, and the dispatching services (police, fire, or ambulance) that they provide (Report 2); and reported on the 911 systems in Alameda County (California), Chicago, and Indianapolis and suggested, on the basis of the experiences of these areas, steps that St. Louis area officials might take in planning for the St. Louis area 911 System (Report 3).

The Institute prepared its series of "911" reports in response to resolutions adopted by the St. Louis County Council and the St. Louis County Municipal League.

The Costs

This report is concerned only with the recurring charges for the proposed 911 Emergency Call System. The method of financing the nonrecurring costs, or one-time charges, has already been determined. Contained in a contract between Southwestern Bell Telephone Company, the City of St. Louis, and St. Louis County is an agreement to divide the one-time costs, with the County paying three-fourths of the estimated $1,680,000 in developmental costs and the City paying one-fourth. All the County's share of the nonrecurring charges will be borne by the County Government.

On September 20, 1977, Southwestern Bell estimated that the recurring charges for the Expanded 911 System would be $102,227 monthly or $1,226,724 annually. This estimate, which could vary as much as 20% from the actual charges, was based on a system with 29 primary answering points and 18 secondary answering points.

Since the system was proposed in September 1977, it has been determined that there will be fewer answering points than initially included in Bell's estimate. However, the Institute is using the cost estimate prepared in September 1977, because Southwestern Bell has not yet revised its original quotation to reflect the change in the number and location of answering points. Nevertheless, while the total cost for a dispatching agency may be less under an updated estimate, an agency's relative share of the operating costs will not be changed.

In an informal agreement, Supervisor Gene McNary of St. Louis County and Mayor James Conway of St. Louis have decided to divide the recurring costs for the Expanded 911 System, with the County to pay two-thirds of the annual charge and the City to pay one-third. On the basis of this agreement, St. Louis County's share will be $809,639 annually, and the City's share will be $417,085 annually.

Table 1 presents the County's share of the recurring costs in a more detailed way. The cost items, from Bell's September 1977 order of magnitude quotation, have been divided into two categories--system-wide items and agency-specific items. This division recognizes that some costs are directly related to the dispatching agencies and some are not specific to any agency.

The agency-specific items generally represent the equipment coming into and located at the answering points. Included in the agency-specific category are the trunk lines coming into the primary and secondary answering points (Item 1, Table 1); the line control units at the primary answering points, which are microprocessors that distribute the 911 calls to the answering attendants and are programmed to facilitate transferring 911 calls (Item 2); the line control units at the secondary answering points and conferencing, the three-way conversations that are set up when a call is transferred (Item 3); the display cabinets at each answering attendant's desk which have calculator-type lighted displays of the caller's phone number and have buttons for transferring 911 calls (Item 4); and the telephone lines that connect the line control units to the display cabinets (Item 5).

The remainder of the items in Table 1 can be considered as system-wide items. They represent the equipment that is not located at an agency and the services needed for the functioning of the system as a whole. Included in the system-wide category are the use of the electronic switcher, the #1 ESS (Item 6); the maintenance of the auxiliary computer, the 3A Processor, and the updating of its data file (Item 7); the maintenance of the geographic file of jurisdictions (Item 8); and the network of trunk lines that carry the 911 calls to and from the #1 ESS (Items 9, 10, & 11).

The amount of equipment at an agency will be related directly to the number of trunk lines coming into the agency. The number of trunks at the agency will, in turn, depend on the volume of calls that the agency receives.

Table 1

SOUTHWESTERN BELL'S SEPTEMBER 1977 ESTIMATE
OF ANNUAL RECURRING CHARGES
EXPANDED 911 SYSTEM FOR ST. LOUIS CITY AND COUNTY

Cost Items	Recurring Charges: St. Louis City & County Combined	St. Louis County's Share	Percent of Total
Agency-Specific Items			
1. Local Channels from End Offices to PSAPs	$ 68,244	$ 45,041	5.6%
2. Primary PSAP Start-up	43,200	28,512	3.5
3. Secondary PSAP Start-up	162,000	106,920	13.2
4. Attendant Circuits	13,716	9,053	1.1
5. Stand Alone Display & Transfer Units	45,492	30,025	3.7
Total	$ 332,652	$219,551	27.1%
System-wide Items			
6. ESS Start-up	$ 14,880	$ 9,821	1.2%
7. Selective Routing & Selective Transfer	206,400	136,224	16.8
8. Geographic File of Emergency Agency Jurisdictions	252,000	166,320	20.5
9. E-911 Trunks & Associated Facilities from End Offices to ESS	218,088	143,938	17.8
10. E-911 Trunks & Facilities from ESS to End Offices Serving PSAPs	197,292	130,213	16.1
11. Speed Calling	5,412	3,572	0.5
Total	$ 894,072	$590,088	72.9%
Grand Total	$1,226,724	$809,639	100.0%

Data compiled by Governmental Research Institute, 915 Olive Street, Room 908, St. Louis, Mo. 63101.
Phone: 241-3063

Southwestern Bell's latest projection for the number of trunk lines needed at each dispatching agency to adequately handle the anticipated 911 call volume is presented in Table 2. Bell made these forecasts from calls for service data that the Institute collected in its February 1978 survey of emergency dispatching agencies. The answering points listed in Table 2 are those recommended by the St. Louis County Advisory Committee on 911.

Table 2

PROPOSED 911 TRUNKS
FOR RECOMMENDED ANSWERING POINTS
ST. LOUIS COUNTY

Answering Points[1]	Proposed 911 Trunks[2]
Primary	
Ballwin P.D.	4
Berkeley P.D.	5
Brentwood P.D.	4
Bridgeton P.D.	6
Clayton P.D.	4
Crestwood P.D.	4
Creve Coeur P.D.	6
Des Peres P.D.	3
Ferguson P.D.	5
Florissant P.D.	5
Glendale P.D.	3
Hazelwood P.D.	4
Jennings P.D.	4
Kirkwood P.D.	5
Ladue P.D.	4
Manchester P.D.	4
Maplewood P.D.	4
Olivette P.D.	3
Overland P.D.	6
Richmond Heights P.D.	4
Rock Hill P.D.	3
St. Ann P.D.	4
Sunset Hills P.D.	4
University City P.D.	9
Webster Groves P.D.	7
NAMPA	9
St. Louis County P.D.[3]	18
Secondary (Fire Alarm Centers)	
Central County	3
North-Central County	5
South County	4
Total	153

[1]The Public Service Answering Points shown in the table are those recommended by the St. Louis County Advisory Committee on 911. It is assumed, for purposes of the table, that the Committee's suggestions for the following consolidation of existing dispatching services will be adopted: Shrewsbury P.D. with Webster Groves P.D.; Ferguson Fire with Ferguson P.D.; Glendale Fire with Glendale P.D.; Jennings Fire with Jennings P.D.; Shrewsbury Fire with Webster Groves P.D. Not included in the system is the Pacific P.D., because only a minor portion of the City of Pacific is in St. Louis County.

[2]Southwestern Bell's estimate based on 1977 calls for service figures that were collected by the Governmental Research Institute from the emergency agencies and appended to the Institute's second report on the proposed 911 system.

[3]The St. Louis County P.D. will, in effect, be six answering points since it has chosen to have a full complement of 911 equipment for each of its five radio zones and the municipal radio zone that it operates. The County P.D. will also function as a secondary answering point when it receives ambulance calls from areas where it does not provide police dispatching services.

Distributing the Costs

Three important questions need to be answered when considering the manner in which St. Louis County's share of the recurring costs should be distributed. First, which political subdivisions of the County should be the basis for apportioning the costs and which jurisdictions should be billed for each subdivision's share of the 911 recurring costs? Second, which of the recurring charges should be distributed? Third, what formula or criteria should be used for distributing the costs? These questions need to be answered before any decision can be made regarding the apportionment of costs among the participants in the 911 Emergency Call System.

To Whom

The first step in developing an allocation formula is deciding the jurisdictional basis on which the costs should be divided. Which of the various political subdivisions in St. Louis County should be used as a basis for determining the shares of the recurring costs and which, in turn, ought to be billed for the costs of the system? Should the costs be allocated (1) to each of the 91 municipalities and to the County for the unincorporated areas, or (2) to each police and fire department in St. Louis County, or (3) to each dispatching agency which provides emergency police, fire, and/or ambulance dispatching services?

For the purposes of this report, the Institute uses the areas served by each dispatching agency as the basis for allocating the recurring costs. There are a number of reasons for this choice. First, the dispatching agencies will be the main components of the 911 system, since they will be the public service answering points. Second, dispatching agencies can be used as the base in the calculations of the costs for all the alternative formulas developed by the Institute, even though, in some cases, elaborate precautions will have to be taken to avoid double-counting where jurisdictional boundaries overlap.

Third, if the recurring costs are allocated to the dispatching agencies, arrangements already exist for subdividing them in the cases where a dispatching agency serves more than one department or municipality. Charges for the additional 911 operating costs could be viewed as another expense to the dispatching center and could subsequently be billed to the participants in the dispatch center according to already existing agreements.

Which Costs

In a previous section of this report, it was pointed out that the recurring costs can be divided into two categories--the agency-specific costs for the equipment at the dispatching sites and the system-wide costs for the general equipment and services which are not located specifically at the dispatching agencies. The question is whether these costs should be allocated separately using two different distribution formulas, or together using one formula.

If the agency-specific and system-wide costs are considered together for distribution according to one formula, the on-site equipment costs will be averaged among the dispatching agencies that participate in the system. However, the equipment requirements of these agencies and the degree to which they utilize the equipment will not be uniform. The number of incoming trunk lines, display cabinets, and attendant circuits at an answering point will vary depending on the volume of calls to be handled. This relationship, however, is not a linear relationship. An agency that receives double the number of calls of another agency will not necessarily need double the number of trunk lines, for example. The number of trunks needed depends on the probability that a call will be blocked. The chances of two calls coming simultaneously are greater than the chances of nine arriving at the same time, even when the area that the emergency agency serves and the number of calls traditionally received are considered. Consequently, the dispatching

agencies receiving relatively fewer calls also have a proportionately greater need for trunk lines when compared to some of the larger dispatching centers.

In addition, some pieces of equipment are designed with a greater capacity than most agencies will require. The line control unit, for example, can accomodate up to 15 trunk lines. While most agencies will not be utilizing this unit at its capacity, some of the larger ones will come closer than others to realizing the potential usage. In short, some of the dispatching agencies will be more efficient because of the volume of calls that they will handle relative to the amount of equipment that they will need.

A distribution method that includes the agency-specific costs together with the system-wide costs will spread the costs of on-site equipment among all dispatching agencies without regard to the equipment that an agency actually has on its premises. It will not take into consideration the differential equipment requirements and efficiencies of the dispatching agencies. If these factors are to be more accurately reflected in the allocation of the recurring costs, each agency should be charged for on-site equipment.

Distributing Agency-Specific Costs

Due to the lack of detailed information concerning such things as the charges for incoming trunks at specific dispatching agencies, the actual equipment costs for each agency cannot be computed at this time. In lieu of actual costs, the Institute has calculated each dispatching agency's share of the agency-specific costs by computing the average costs of a trunk line and the equipment associated with it. This is done because the associated equipment needs (display cabinets, attendant circuits) are directly related to the number of trunk lines. From Table 2 above, it can be seen

that the number of incoming trunk lines at the answering points has been estimated to be 153. From Table 1 above, it can be seen that the County's share of the agency-specific costs (assuming the County's share of all items to be two-thirds of the total City-County costs) will be $219,551. Given these estimates, the cost of an average trunk line and the equipment associated with it would be $1,435 annually. Thus, if a dispatching agency has three trunks, its costs for on-site equipment will be $4,305, or three times $1,435.

By determining each agency's share of the agency-specific costs in terms of the costs of an average trunk line, the Institute has made certain assumptions. One, the mileage charges for the incoming trunks themselves are to be averaged among all the agencies. It will be recalled, that the costs of incoming trunk lines (Item 1, Table 1) are based on the distance from the central office to the dispatching agency or answering point. But, in effect, the costs for the trunk lines have been computed as if every agency were the same distance from telephone company offices. Two, all agencies will choose to have one display cabinet for every incoming trunk line. When Bell made its estimate, this assumption was made. However, it is possible for more than one trunk line to be connected to a display cabinet, and in fact, some agencies might choose to do so. Three, the charges for conferencing (the three-party conversation feature used in transfers) have been averaged among both the primary and secondary answering points. However, some of the primary answering points (10 municipal police departments) will not have any need for this feature, since they will provide all dispatching services to their service area and will not need to transfer 911 calls to a secondary.

Distributing System-wide Costs

Remaining to be distributed are the system-wide costs. The estimated costs of these is $590,088, which is 73% of the County's share of the recurring costs for the 911 Emergency Call System. In this section, the Institute discusses four alternative criteria that might be used in a formula to apportion the system-wide costs among the dispatching agencies in the County. The rationale for each criterion is given, together with some arguments for and against each criterion.

The distribution criteria presented in this section fall into two categories. In one category are those criteria that measure a dispatching agency's share of the system-wide costs in terms of its actual usage of the system. In the other category are those measures of potential usage or benefits that might be derived from the 911 system. As will be seen in the next section of this report, each criterion, when used individually in a distribution formula, will have a different impact on a dispatching area's share of the costs, and when these criteria are used in combination there is still another effect.

CALLS FOR SERVICE. The number of emergency calls received by a dispatching agency is an indicator of the use that the agency will make of the proposed system. The justification for this criterion is that the dispatching agencies using the 911 system the most will pay the most.

This allocation criterion has the additional advantage that the number of 911 calls will be an easily collectable statistic. Once the 911 system goes into operation, it will be possible for Bell to constantly count the calls arriving at each agency. Since the number of calls can easily be counted, it will be possible to periodically readjust each dispatching area's share of the costs to reflect changed patterns of usage.

POPULATION SERVED. The number of residents living in an area served by a dispatching agency is one indicator of the number of potential users

or beneficiaries of the system. To distribute the costs according to this factor is to assume that the 911 service is available to everyone whenever it is needed and that the costs allocation ought to reflect the fact that all residents in an area served by a dispatching center could potentially benefit from the system.

This criterion for apportioning the costs has the drawback of being based only on residential users in the service area. The nonresidents who work at the commercial and industrial establishments, who potentially could use the service, would not be counted in a formula based solely on population. Estimating the number of these nonresidents for each area would be very difficult. Since there are more businesses and industries in some of the dispatching areas, the areas with a greater residential composition would pay disproportionately more for the 911 service.

Although population totals are directly obtainable from the Census Bureau's published reports for the incorporated and unincorporated areas of the County, population counts for agencies such as the fire alarm centers have to be compiled from the Census Bureau's detailed "block statistics," whenever they are available. In some instances, estimates of the population have to be made. Also, since the Census Bureau does not conduct a census every year, an estimate of each dispatching area's population change will need to be made periodically if the relative share that the agency pays is to be kept current.

ASSESSED VALUATION. While traditionally thought of as a measure of ability to pay, assessed valuation can be viewed as an indicator of the potential beneficiaries of a 911 system. Property requires protection as well as people. The assessed valuation of a dispatching area represents the value of the residential and commercial property that could receive benefits from the 911 service.

The major criticism of a formula based on assessed valuation relates to the inequities of assessments in the County. The percentage that the assessed value is of the current market value is not uniform throughout the County. As a result, the areas in which the assessed valuation is more reflective of the current market value would pay disproportionately more for their 911 service.

Assessed valuation figures are readily available from the St. Louis County Department of Revenue and can be easily compiled by dispatching agency jurisdiction. In addition, because of the availability of valuation figures, an agency's share of the recurring costs could be determined beforehand, allowing lead time for budget planning, and an agency's share of the costs could be readjusted annually. In an indirect way, the patterns of growth will be reflected through the changes in assessed valuation.

NUMBER OF MAIN TELEPHONE STATIONS. The number of main telephone stations--the number of telephone numbers--is yet another indicator of the potential users and beneficiaries of a 911 system. Since every phone in the area served by a dispatching center could be used to place a 911 emergency call, the number of main stations is a measure of potential usage and benefit. Furthermore, it counts not only residential, but also commercial and industrial, subscribers among its potential users and beneficiaries.

Although data are not presently available to indicate the number of main stations that are within the jurisdictions of the dispatching agencies, this information will be available before 911 service begins. The total number of main stations in the area served by each dispatching agency will be obtainable from the computer file that will be used for the selective routing of 911 calls to the answering points. Consequently, an agency's share of the costs can be determined prior to the beginning of 911 service, thereby allowing lead time for budget planning. Once the system is in operation, periodic adjustments in an agency's share of the recurring costs will be possible.

Use of this criterion would require that consideration be given to the question of how to count equitably the number of main stations of large Centrex and PBX telephone systems.

The Alternative Formulas

To determine the effects that different criteria might have on an agency's share of the 911 recurring costs, the Institute computed the costs using five formulas based on three of the four criteria discussed in the previous section. The number of main telephone stations was not included in the calculations, because the data are not available at the present time.

The estimated total costs that each dispatching agency would incur under each of the five formulas is presented in Table 3. In each of the five formulas, the County's share of the recurring costs was divided into two categories--the agency-specific costs and the system-wide costs. (See Table 1.) The agency-specific costs of $219,551 were apportioned to each dispatching agency in proportion to the number of trunk lines that have been estimated for the agency. (See Table 2.) Each agency's share of the agency-specific costs were added to its share of the system-wide costs. An agency's share of the total system-wide costs of $590,088 were computed using one or a combination of the following three factors: service calls, population, and assessed valuation.*

FORMULA 1. The distribution criterion used in the first formula is calls for service, exclusive of administrative calls. Under this formula, an agency's share of the system-wide costs is equal to its percentage of the 856,392 service calls received in 1977 by all of the emergency agencies in St. Louis County. For the most part, the data used in this formula were obtained by the Institute in its February 1978 survey of the dispatching agencies, but some revisions have been made to take into account more accurate figures received subsequently on administrative calls.

Consistent with recommendations of the County Advisory Committee on 911 for consolidation of certain dispatching services, the calls for the Ferguson

*For the detailed formulas, see Appendix.

Table 3

ANNUAL CHARGES FOR A 911 EMERGENCY CALL SYSTEM
ALLOCATED TO EACH DISPATCHING AGENCY IN ST. LOUIS COUNTY
ON THE BASIS OF ALTERNATIVE FORMULAS

Dispatching Agency*	Basis of the Formula			3 Factors Combined	
	Service Calls	Popu-lation	Assessed Valuation	Equal Weight To Each	S.C. 50% Pop. 25% Ass. Val. 25%
Ballwin P.D.	$ 14,050	$ 17,360	$ 16,086	$ 15,832	$ 15,387
Berkeley P.D.	23,170	23,902	21,707	22,926	22,987
Brentwood P.D.	10,923	11,867	13,531	12,107	11,811
Bridgeton P.D.	38,110	18,378	24,538	27,009	29,784
Clayton P.D.	15,171	15,171	22,825	17,722	17,085
Crestwood P.D.	11,690	14,174	14,068	13,311	12,906
Creve Coeur P.D.	29,023	18,803	30,540	26,122	26,847
Des Peres P.D.	7,607	8,611	11,455	9,224	8,820
Ferguson P.D.	19,158	28,640	21,471	23,090	22,107
Florissant P.D.	24,469	46,160	25,979	32,203	30,269
Glendale P.D.	6,368	8,434	7,737	7,513	7,227
Hazelwood P.D.	16,116	14,228	19,373	16,572	16,458
Jennings P.D.	15,053	28,690	22,128	21,957	20,231
Kirkwood P.D.	19,925	26,380	22,580	22,962	22,203
Ladue P.D.	10,982	12,221	17,909	13,704	13,024
Manchester P.D.	14,876	10,510	9,076	11,487	12,335
Maplewood P.D.	14,817	12,634	12,002	13,151	13,568
Olivette P.D.	7,726	9,791	11,632	9,716	9,219
Overland P.D.	32,741	36,913	29,531	33,062	32,982
Richmond Heights P.D.	15,407	13,519	13,006	13,977	14,335
Rock Hill P.D.	9,142	8,315	7,141	8,199	8,435
St. Ann P.D.	15,407	15,502	12,900	14,603	14,804
Sunset Hills P.D.	12,575	8,014	9,182	9,924	10,587
University City P.D.	75,754	40,586	31,120	49,153	55,804
Webster Groves P.D.	46,641	31,464	27,198	35,101	37,986
NAMPA	74,928	21,885	20,770	39,194	48,128
St. Louis Co. P.D.	187,938	247,948	274,928	236,939	224,682
Central Co. Alarm	9,083	11,502	16,264	12,283	11,483
North-Central Co. Alarm	18,863	30,458	26,239	25,187	23,606
South Co. Alarm	11,926	17,579	16,723	15,409	14,539
Total	$809,639	$809,639	$809,639	$809,639	$809,639

*Costs have been allocated to each dispatching agency on the basis of the entire area for which the agency dispatches emergency services and the types of services which the agency dispatches (police, fire, or ambulance). For example, the Ballwin Police Department dispatches police services for an area which includes not only the City of Ballwin, but also the cities of Ellisville and Manchester, so all charges for dispatching police services in this three-city area have been allocated to Ballwin.

However, fire and ambulance services in Ballwin, Ellisville, and Manchester are dispatched by the Central County Fire Alarm Center, which also dispatches for a much larger area. Charges for dispatching fire and ambulance services in these three cities are, therefore, included in the charges allocated to the Central Fire Alarm Center. (For the areas served by each dispatching agency and the emergency services dispatched by the agency, see the second report in the series of reports prepared by the Governmental Research Institute on the proposed 911 Emergency Call System.)

Data compiled by Governmental Research Institute, 915 Olive Street, Room 908, St. Louis, Missouri 63101. Phone: 241-3063

Fire Department were included in the share for the Ferguson Police Department, Glendale Fire Department's calls were included in the Glendale Police Department's share, the calls for the Jennings Fire Department were included in the Jennings Police Department total, and the calls for the Shrewsbury Fire and Police Departments were included in the Webster Groves Police Department total. The Pacific Police Department was not included in the calculations.

The results of the first formula are presented in the first column of Table 3 under the heading "Service Calls." The charge given in the table represents each dispatching area's combined share of the agency-specific and system-wide costs.

Since many of the emergency agencies differed in the kinds of calls which they included in the data given to the Institute and since some agencies estimated the number of calls received, precise comparisons of the costs under this formula are not possible. The figure in Table 3 represents the best estimate that can be made of an agency's costs given the data available at this time. With the cooperation of the various dispatching agencies, it should be possible to develop more precise figures on service calls before the 911 system goes into effect.

FORMULA 2. The criterion used in the second formula to distribute the system-wide costs is population. For this formula, the system-wide costs were further subdivided into two categories. In one category were the costs to be distributed among the agencies providing police dispatching services. These police distributable costs amounted to $531,079, or 90% of the total system-wide costs. In the other category were the system-wide costs that were to be distributed among the agencies that dispatch fire calls. The fire distributable costs totaled to $59,009, or 10% of the system-wide costs.

The system-wide costs were subdivided into police and fire distributable costs because not all of the agencies perform both dispatching functions. When the police and fire costs are separated and apportioned independently,

the recurring costs are distributed to the dispatching agencies in relation to the dispatching services that they actually provide. The 90-10 split of costs was chosen because, on the average, 90% of the emergency calls in the County have been for police service and 10% have been nonpolice calls.

The costs presented in the second column of Table 3 were determined in the following manner. First, the proportion of the County's total population served by each agency providing police dispatching services was determined and then that proportion was applied to the police distributable costs ($531,079) to arrive at each agency's share of the police-related system-wide costs. Similarly, where applicable, the proportion of the County's population served by each agency providing fire dispatching services was computed, and that proportion was applied to the fire distributable costs of $59,009. Then, the agency-specific costs, the police distributable costs, and the fire distributable costs applicable to each agency were summed to get the agency totals presented in the second column of Table 3.

The Institute used the Census Bureau's 1975 population estimates in its calculations. The 1975 population for the three alarm centers was projected by the Institute using the 1970 population counts for fire protection districts that were compiled by the St. Louis County Planning Department. Again, the agencies included in the calculations were those established by the St. Louis County Advisory Committee on 911 and the recommended consolidations were considered by the Institute in its calculations.

FORMULA 3. In the third formula, an agency's share of the system-wide costs is related to its assessed valuation. As in Formula 2, the system-wide costs were divided into police distributable costs and fire distributable costs. The police distributable costs were allocated to each agency providing police dispatching services in proportion to the percentage of the County-wide assessed valuation that is located in the area the agency serves. Likewise,

the fire distributable costs were distributed among the agencies with fire dispatching services in relation to the proportion of the County-wide assessed valuation in each area. Each agency's total share of the applicable agency-specific, police distributable, and fire distributable costs can be found in the third column of Table 3.

Included in the assessed valuation total for the area served by a dispatching agency were the valuations for real and personal property, state and locally assessed utilities, and merchants and manufacturers inventories. The data were provided to the Institute by the St. Louis County Revenue Department and represents the 1977 valuations.

FORMULA 4. The fourth alternative formula is really a composite of the first three formulas. It is based on the premise that an agency's costs should reflect its actual usage of the system as well as the potential benefit that its citizens, businesses, and residences can derive from the system. It was computed by averaging each agency's costs under the first three formulas. In effect, equal weight has been given in this formula to each of the three factors--service calls, population, and assessed valuation. The impact on a dispatching agency of an extremely high charge under one of the distribution criteria is offset by averaging the charge among all the charges to the agency. Hence, the agency is not affected as much as it would be under a single-factor formula. The resulting charges for each agency are shown in the fourth column of Table 3.

FORMULA 5. The fifth formula used by the Institute to apportion the recurring costs is also a composite of the first three formulas. However, more weight is given in this formula to calls for service, a measure of actual usage. In fact, an agency's calls for service account for half of its share of the system-wide charges. The other half of its system-wide charges are based equally on its population and its assessed valuation, both measures of potential usage and benefit.

As was the case in the fourth formula, it is recognized that there are several factors representing both actual and potential usage that can be used to determine an agency's charges. Under this formula, equal weight is given to actual and potential usage. Also, to some extent, the impact of each distribution criterion on an agency's charges is balanced out. The charges under this formula are given in the fifth column of Table 3.

The effects of each formula on an agency's share of the total operating costs of the proposed 911 system can be seen in Table 4. Presented in Table 4 is the percentage of the County-wide recurring costs that would be due from each agency under each of the five alternative formulas. By looking at these percentages, it is possible to evaluate the impact of each formula. For example, Clayton, the City with the second highest assessed valuation in the County, would pay a greater percentage of the total costs under a formula based solely on assessed valuation than it would under one based only on service calls or population. The University City Police Department, the Webster Groves Police Department, and NAMPA, on the other hand, would pay considerably more for their 911 service under a formula based solely on service calls. Perhaps this marked difference in relative share is partly attributable to the fact that the estimate of service calls made to these three agencies was on the high side.

Under the fourth formula (equal weight to all three factors), the extreme effect on these three agencies of the service calls formula is somewhat offset. For other dispatching agencies, such as the Brentwood Police Department, the percentages are similar. In other words, each formula has a different effect on an agency's share of the annual recurring costs.

Table 4

% OF TOTAL ANNUAL CHARGES FOR A 911 EMERGENCY CALL SYSTEM ALLOCATED TO EACH DISPATCHING AGENCY IN ST. LOUIS COUNTY ON THE BASIS OF ALTERNATIVE FORMULAS

	Basis of the Formula				
				3 Factors Combined	
Dispatching Agency	Service Calls	Population	Assessed Valuation	Equal Weight to Each	S.C. 50% Pop. 25% Ass. Val. 25%
Ballwin	1.74%	2.14%	1.99%	1.96%	1.90%
Berkeley	2.86	2.95	2.68	2.83	2.84
Brentwood	1.35	1.47	1.67	1.50	1.46
Bridgeton	4.71	2.27	3.03	3.34	3.68
Clayton	1.87	1.87	2.82	2.19	2.11
Crestwood	1.44	1.75	1.74	1.64	1.59
Creve Coeur	3.59	2.32	3.77	3.23	3.32
Des Peres	0.94	1.06	1.41	1.14	1.09
Ferguson	2.37	3.54	2.65	2.85	2.73
Florissant	3.02	5.70	3.21	3.98	3.74
Glendale	0.79	1.04	0.96	0.93	0.89
Hazelwood	1.99	1.76	2.39	2.05	2.03
Jennings	1.86	3.54	2.73	2.71	2.50
Kirkwood	2.46	3.26	2.79	2.84	2.74
Ladue	1.36	1.51	2.21	1.69	1.61
Manchester	1.84	1.30	1.12	1.42	1.52
Maplewood	1.83	1.56	1.48	1.62	1.68
Olivette	0.95	1.21	1.44	1.20	1.14
Overland	4.04	4.56	3.65	4.08	4.07
Richmond Heights	1.90	1.67	1.61	1.73	1.77
Rock Hill	1.13	1.03	0.88	1.01	1.04
St. Ann	1.90	1.92	1.59	1.80	1.83
Sunset Hills	1.55	0.99	1.13	1.23	1.31
University City	9.36	5.01	3.84	6.07	6.89
Webster Groves	5.76	3.89	3.36	4.34	4.69
NAMPA	9.26	2.70	2.57	4.84	5.94
St. Louis County	23.21	30.63	33.96	29.25	27.75
Central Co. Alarm	1.12	1.42	2.01	1.52	1.42
North-Central Co. Alarm	2.33	3.76	3.24	3.11	2.92
South Co. Alarm	1.47	2.17	2.07	1.90	1.80
Total	100.00%	100.00%	100.00%	100.00%	100.00%

Data compiled by Governmental Research Institute, 915 Olive Street, Room 908, St. Louis, Missouri 63101. Phone: 241-3063

Summary

Alternative methods of distributing St. Louis County's share of the annual recurring costs for the proposed 911 Emergency Call System have been the subject of this report. Alternative formulas are presented, because the Institute recognizes that there are a number of possible goals to be attained in apportioning the costs, and each formula has different consequences.

In this report, the Institute assumes that the recurring costs will be allocated to the dispatching agencies that have been recommended by the St. Louis County Advisory Committee on 911 as the public service answering points for the proposed system. Each agency's costs are based on the entire area that it serves and the kinds of dispatching services that it provides.

The County's share of the total City-County operating costs have been subdivided by the Institute into agency-specific costs and system-wide costs. Agency-specific costs are those representing trunk lines coming into an agency and the equipment located at the agency. The agency-specific costs are alloted to each dispatching agency on the basis of the number of trunk lines that it will have when the 911 system goes into operation.

The system-wide costs are distributed among the agencies on the basis of three criteria used separately, and also in combination with different weights given to each criterion. These distribution criteria, representing measures of both actual and potential usage, are service calls, population, and assessed valuation. Another possible criterion, the number of main stations, was not used because the data were not available.

The combined total of agency-specific and system-wide costs allocated to each agency, using the various distribution factors in alternative formulas, are presented in Table 3. In Table 4, each dispatching area's percentage of the total recurring costs under each formula are given, so that a comparison of the effects of each distribution formula on an agency's share of the 911 operating costs can be made. The formulas are detailed in the Appendix.

APPENDIX

The alternative formulas used to compute each dispatching area's share of the County-wide recurring costs as shown in Table 3 are:

FORMULA 1 - SERVICE CALLS

$$\text{Agency's Share} = \left(\frac{\text{Agency's Service Calls}}{\text{County-wide Service Calls}} \times \text{System-wide Costs}\right) + \left(\frac{\text{Agency's Trunks}}{\text{Total Trunks}} \times \text{Agency-Specific Costs}\right)$$

FORMULA 2 - POPULATION

$$\text{Agency's Share} = \left(\frac{\text{Area's Pop. Receiving Police Dispatch Service}}{\text{Total County Pop.}} \times \text{Police Distributable Costs}\right) + \left(\frac{\text{Area's Pop. Receiving Fire Dispatch Service}}{\text{Total County Pop.}} \times \text{Fire Distributable Costs}\right) + \left(\frac{\text{Agency's Trunks}}{\text{Total Trunks}} \times \text{Agency-Specific Costs}\right)$$

FORMULA 3 - ASSESSED VALUATION

$$\text{Agency's Share} = \left(\frac{\text{Assessed Valuation in Area Receiving Police Dispatch}}{\text{County-wide Assessed Valuation}} \times \text{Police Distributable Costs}\right) + \left(\frac{\text{Assessed Valuation in Area Receiving Fire Dispatch}}{\text{County-wide Assessed Valuation}} \times \text{Fire Distributable Costs}\right) + \left(\frac{\text{Agency's Trunks}}{\text{Total Trunks}} \times \text{Agency-Specific Costs}\right)$$

FORMULA 4 - COMBINED FACTORS WITH EQUAL WEIGHTING

Agency's Share = (Formula 1 x 1/3) + (Formula 2 x 1/3) + (Formula 3 x 1/3)

FORMULA 5 - COMBINED FACTORS WITH UNEQUAL WEIGHTING

Agency's Share = (Formula 1 x 1/2) + (Formula 2 x 1/4) + (Formula 3 x 1/4)

Cost Figures Used in the Formulas:

System-wide Costs = $590,088
Agency-Specific Costs = $219,551
Police Distributable Costs = $531,079
Fire Distributable Costs = $59,009

END